*for*

engineers and contractors controlling the design, specification, installation and maintenance of heating, ventilating and air conditioning.

# HEATING AND VENTILATING

*The Air Conditioning Monthly*


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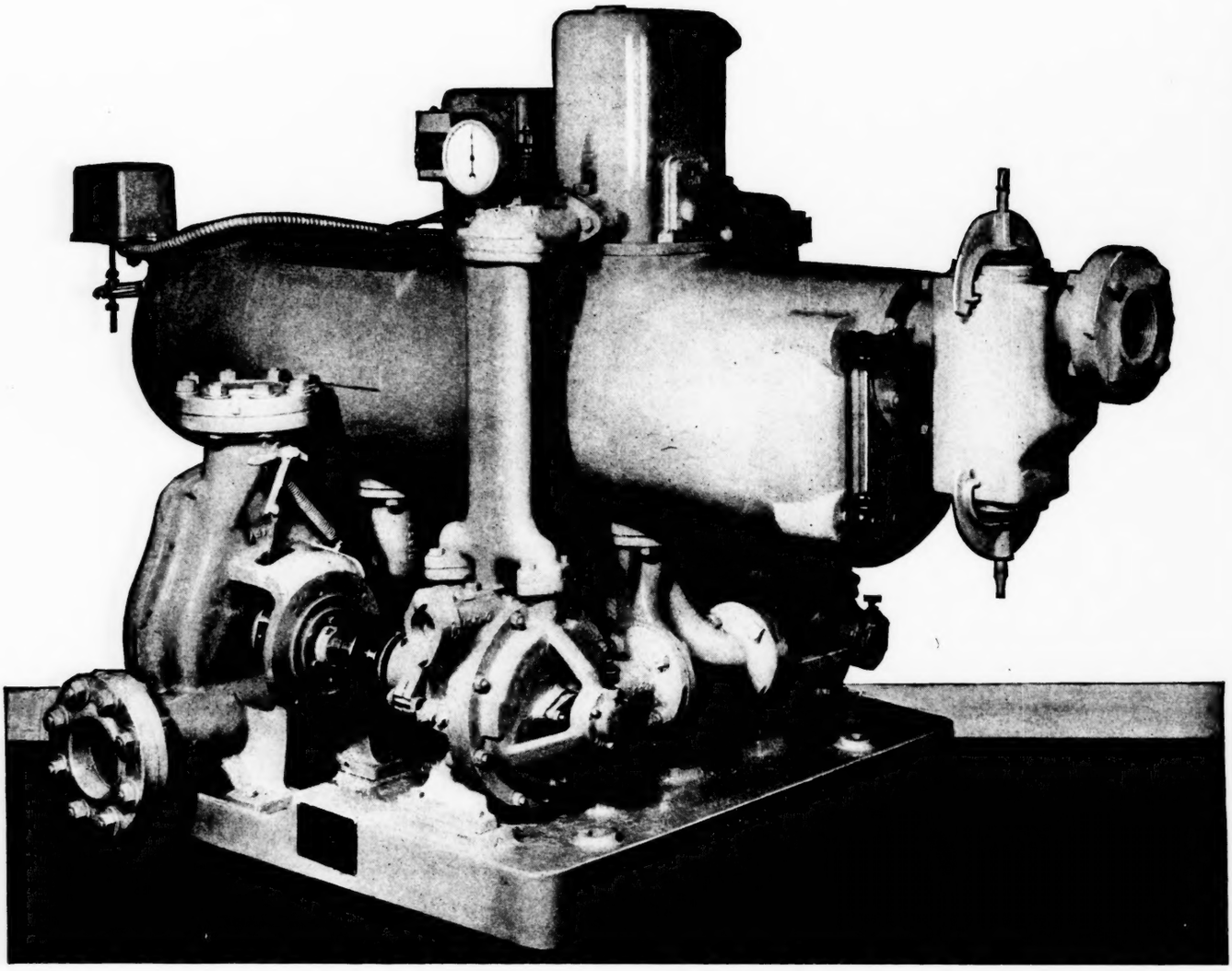
# Where building heat *MUST NOT FAIL* always specify the Nash Vapor Turbine



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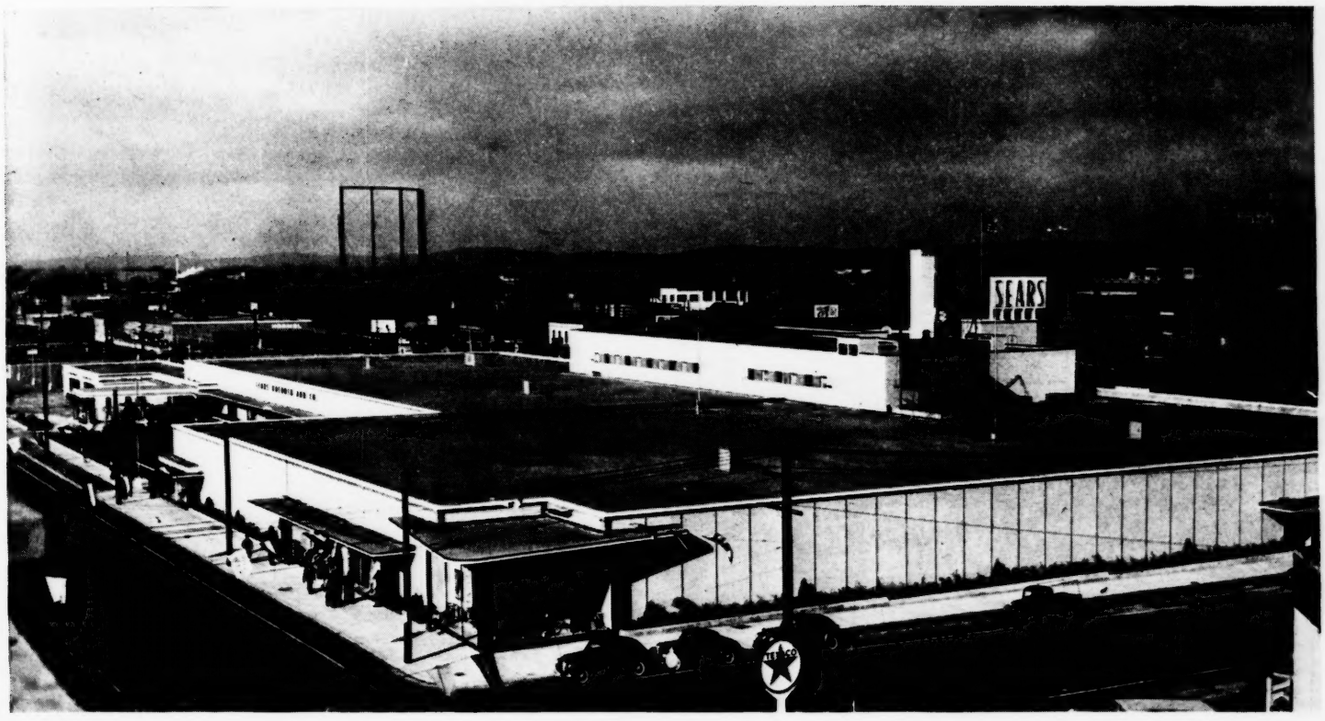



*Fig. 1. The new Sears, Roebuck & Co. store in Birmingham, Ala. Note the cooling tower in front of the chimney.*

# 350 TONS OF AIR CONDITIONING

## *provided by Sears, Roebuck & Co., for its windowless Birmingham store described by George H. Watson*

AIR conditioning has made possible the largest single floor windowless store in the country, the new $2,000,000 retail establishment recently opened in Birmingham, Ala., by Sears, Roebuck & Co.

The store's entire selling, service and storage area is located on one floor, so that it is reported to be the largest one-floor store in America. A small second floor space accommodates the general offices and employe recreation rooms. The building is windowless and has a flat tar and gravel roof on a concrete slab

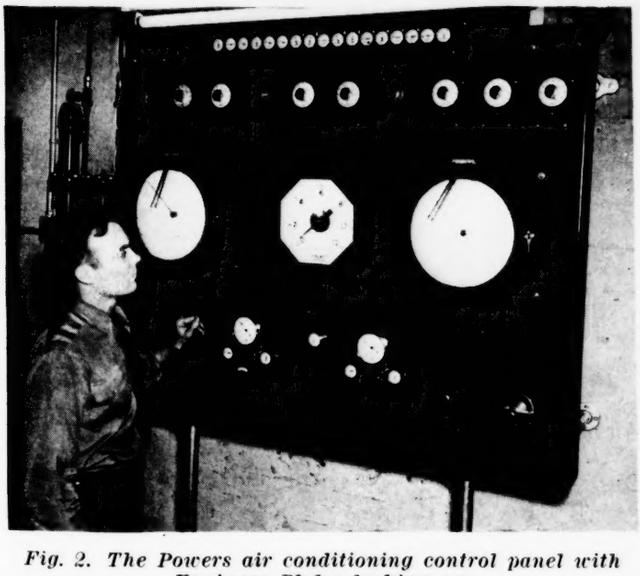


*Fig. 2. The Powers air conditioning control panel with Engineer Plyler looking on.*

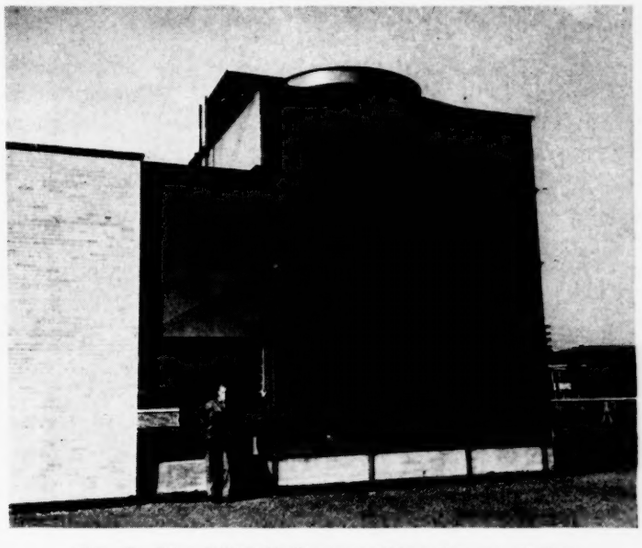


*Fig. 3. The Lilie-Hoffman cooling tower at the Sears Birmingham store.*

*Fig. 4. Interior of store, showing Uniflo supply grilles along the walls, and one of return air grilles in center ceiling.*

and two inches of insulation. This design was decided upon with full knowledge that the wide expanse of the store (it has 110,750 square feet and is 475 feet long in its longest extremity) could be made perfectly comfortable with air conditioning.

Sears' executives estimate that the one-floor arrangement will save up to 30% of the customers' time, as they will not have to climb stairs or wait on elevators. Furthermore, the store is set down in the midst of a two-block area with a parking space for five hundred cars, thus providing another convenience for customers. Thus, air conditioning makes its contribution to the comfort and convenience of the customer.

Principal air conditioning equipment includes a 350-ton centrifugal compressor powered by a 350 hp Crocker-Wheeler motor. This equipment is located in the basement as are two Brownell stoker-fed steam boilers, each having a capacity of 20,000 sq ft E.D.R. From this basement cold (or hot) water is circulated by Westco, Buffalo and Dayton Dowd pumps to five air conditioning units located in roof penthouses.

From the penthouse units about 1½ miles of USS sheet metal ducts extend down through the roof slab and distribute the conditioned air throughout the store. Some 140,000 lb of metal was required to fabricate these ducts which vary in size from 12 x 12 in. to 150 x 40 in.

The five units supply a total of 160,000 cfm. Three units serve the main retail selling area, which is divided into three zones, each with its own set of controls. A fourth unit services the stock room, and a fifth the second floor offices.

The ducts extend entirely around the walls of the store and air is diffused through about six hundred Barber-Colman Uniflo flow and return grilles. Return air is drawn through ceiling return grilles and recirculated to the conditioning units, while outside air is taken from the roof of the penthouse. Included in the first floor ceiling are four sets of grilles that allow excess air to escape to the penthouse and to the outside. This relieves the pressure in the building created by the volume of outside air supplied by the supply system. Clarage fans are used.

In the air conditioning system there are approximately 20 spaces that required booster heating coils for the winter season, due to their location, and these heaters are supplied from the central steam plant and each controlled by individual Powers pneumatic thermostats in these areas. The central control panel is in the basement.

In addition to the central air conditioning system, separate heat and ventilation was provided for 16 spaces, which are either isolated or need large volumes of air passing through them, as for instance the lighting display area and the tailor shop.

Air filters in the central system are of the American self-cleaning, oil bath type. The Lilie-Hoffman cooling tower is located on the roof. Coils are by McQuay, Inc.

The building was designed by John Raben, designer of Sears, Roebuck & Co.'s store planning and display section and by John Stokes Redden of the property department. Daniel Construction Co., Birmingham, was the general contractor. Mason & Dulion, Birmingham, were contractors for the heating and Shook & Fletcher Supply Company, Birmingham, for the air distribution system. The plumbing contract was held by Tully Plumbing and Heating Co., Birmingham.

# *Practical Data for Solving*
# WARTIME FUEL STORAGE PROBLEMS

**By mid-February the fuel situation in New England already had serious aspects; by February 20 one of the large oil companies was advertising in New York newspapers that oil would be supplied to oil burner users only when tanks were less than 20% filled and would be filled to only 75% of their capacity. While there is reason to believe that transportation difficulties may also affect coal by next winter, the shortage is more severe in the case of oil than with solid fuels. For that reason many oil burning plants have already changed over their systems to solid fuels; others are considering it, and probably a great deal more will eventually become involved in this question. Stoppage of burner installations is imminent.**

**One of the vital points in connection with the changeover is the matter of fuel storage and for that reason the accompanying article has been prepared to summarize some of the useful data and information on coal storage, applicable to plants for both large and small buildings.**

THE present disturbance in the availability of oil fuel along the Atlantic seaboard, together with the outlook for continuing unsettled conditions in the supply of this fuel, have already been sufficient to cause a number of plants to convert to coal. This is particularly true of the larger plants, since the domestic consumer has not as yet been sharply enough affected to change over on a large scale.

The present oil shortage is caused by a lack of transportation facilities, largely due to (a) the sinking of, at this writing, 22 tankers by enemy submarines and (b) diversion of tankers from East coast service to the Pacific coast for one reason and another connected with Pacific military and naval operations. For that reason it has been found desirable to cut down on the amount of fuel sold to a given consumer for the remaining winter months. It is to be assumed that fuel oil stocks will again be at least partially built up during the spring and summer months but, since there is every reason to believe that the war will continue throughout next winter, it also seems reasonable to assume that the oil shortage will be even more severe next winter than is the case this year.

On the other hand, while there is no shortage at the present time in transportation facilities for coal, nevertheless, as the country becomes more and more engaged in its war efforts, and as new plants begin to swing into production, with the resulting flow of raw and finished materials from one part of the country to another, there is reason to feel that the coal transportation problem may also become rather severe. It seems to be a fair assumption, however, that coal supplies will be built up during summer months when the demand is low and it is difficult to foresee any serious solid fuel shortage until the cold winter months. Obviously, then, the consumer's next move should be, if he decides to convert his plant from oil to coal, to plan on laying in a supply of fuel during the summer months in sufficient quantity to carry through the following heating season. This raises the question of coal storage, the subject of this article.

### Storage Space

In order to provide sufficient space for storage of a season's supply of coal it is necessary to determine (a) the consumption of coal for a heating season and (b) based on this, the volume occupied by such a quantity of coal. To assist in solving (b) Table 1 has been prepared to show the space required per ton of bituminous, semi-bituminous, and anthracite coals of different origin and sizes. At the same time, and as a matter of interest, Table 2, giving similar information for wood and miscellaneous solid fuels, has been included, although it is not particularly pertinent to the immediate problem. Similarly, Tables 3 and 4, covering oil and other liquid fuels, have been prepared and are included.

The storage space required for a season's operation of a heating plant, not including service hot water, for installations in most parts of the United States[1] can be determined by the formula

$$T = \frac{H \times D}{(70 - t_o) \times E \times F \times 67}$$

where

- $T$ = seasonal coal consumption for heating for a normal year, exclusive of service hot water, in tons of 2000 lb,
- $H$ = estimated hourly heat loss under design (coldest) conditions[2],
- $D$ = normal seasonal total of degree days for locality in question,
- $t_o$ = outside design temperature for locality in question,
- $E$ = overall efficiency of heating plant, expressed as a decimal, and
- $F$ = heating value of coal used, per pound. (See Table 1.)

To the tons of coal obtained from the above should be added the coal required for service hot water. This can be estimated from such data as that given in H & V's Reference Data 41-42.

Then, knowing the seasonal coal requirements in tons, refer to Table 1 for the space in cubic feet required per ton for the fuel in question, multiply T by

[1]Except the deep South, the three most Northern central states, and the Pacific Coast. For these sections, see Degree-Day Handbook.

[2]If H is not available multiply the square feet of installed equivalent steam radiation by 240 and use the product instead of H.

TABLE 1. STORAGE SPACE REQUIRED FOR AND HEAT CONTENTS OF VARIOUS COALS

| Source and Size | Space Required, Cu. Ft. per Short Ton | Space Required, Cu. Ft. per Long Ton | Heat Value, B.t.u. per Lb.† |
|---|---|---|---|
| **BITUMINOUS COAL** | | | |
| Alabama domestic | 44.0 | 49.3 | 11,700 to 14,200 |
| Alabama run-of-mine | 37.1 to 39.3 | 41.5 to 44.0 | |
| Arkansas run-of-mine | 33.6 to 40.4 | 37.6 to 45.2 | 12,700 to 13,700 |
| Colorado lump | 38.1 to 39.6 | 42.6 to 44.4 | 10,000 to 13,500 |
| Colorado domestic | 40.5 | 45.4 | |
| Georgia 60% lump, 10% nut, 30% slack | 37.1 | 41.5 | 12,000 to 14,000 |
| Illinois domestic lump | 40.5 | 45.4 | 10,300 to 12,200 |
| Illinois run-of-mine | 36.1 to 36.8 | 40.4 to 41.2 | |
| Illinois lump | 41.3 to 45.5 | 46.2 to 50.9 | |
| Iowa 60% lump, 25% nut, 15% slack | 43.0 | 48.1 | 9,000 to 11,000 |
| Kansas 90% lump, 5% nut | 36.1 | 40.5 | 10,700 to 12,700 |
| Kentucky 95% lump, 5% nut | 36.7 to 46.6 | 41.0 to 52.1 | 11,500 to 14,300 |
| Kentucky lump | 42.1 to 44.5 | 47.1 to 49.8 | |
| Montana 90% lump, 5% nut, 5% slack | 38.7 | 43.4 | 10,500 to 11,500 |
| Ohio 90% lump, 5% nut, 5% slack | 40.9 | 45.8 | 12,000 to 13,000 |
| Ohio 70% lump, 15% nut, 15% slack | 42.1 | 47.1 | |
| Ohio 60% lump, 30% nut, 10% slack | 43.0 | 48.1 | |
| Ohio 40% lump, 20% nut, 20% slack | 40.0 | 44.8 | |
| Oklahoma 40% lump, 20% nut, 20% slack | 40.0 | 44.8 | 12,200 to 14,000 |
| Oklahoma 35% lump, 45% nut, 20% slack | 41.3 | 46.2 | |
| Pennsylvania 90% lump, 5% nut, 5% slack | 40.4 to 42.6 | 45.2 to 47.6 | 11,900 to 14,300 |
| Pennsylvania 70% lump, 20% nut, 10% slack | 39.6 | 44.4 | |
| Pennsylvania 60% lump, 25% nut, 10% slack | 39.6 | 44.4 | |
| Pennsylvania 20% lump, 30% nut, 50% slack | 38.5 | 43.1 | |
| Pennsylvania 10% lump, 15% nut, 75% slack | 38.5 | 43.1 | |
| Pennsylvania 10% nut, 90% slack | 37.4 to 40.5 | 41.8 to 45.4 | |
| Pennsylvania slack | 38.5 | 43.1 | |
| Pennsylvania lump | 43.0 | 48.1 | |
| Utah 90% lump, 5% slack | 45.0 | 50.4 | 12,000 to 13,000 |
| **SEMI-BITUMINOUS COAL** | | | |
| West Virginia 70% lump, 15% nut, 10% slack | 36.1 | 40.4 | 13,600 to 14,800 |
| West Virginia 60% lump, 30% nut, 10% slack | 42.6 | 47.6 | |
| West Virginia 20% lump, 10% nut, 70% slack | 36.4 | 40.7 | |
| West Virginia 5% lump, 10% nut, 85% slack | 36.1 | 40.4 | |
| West Virginia 4% lump, 2% nut, 94% slack | 37.1 | 41.5 | |
| West Virginia 3% lump, 5% nut, 92% slack | 34.8 | 39.0 | |
| West Virginia 5% nut, 95% slack | 35.4 | 39.6 | |
| **ANTHRACITE** | | | |
| Pennsylvania egg | 34.6 to 37.8 | 38.8 to 42.3 | 12,800 to 13,400 |
| Pennsylvania chestnut | 35.4 to 38.1 | 39.6 to 42.6 | |
| Pennsylvania pea | 36.8 to 37.4 | 41.2 to 41.9 | |
| Pennsylvania buckwheat | 39.6 | 44.4 | |

†High and low values reported from state in question; heat value does not necessarily apply to the density data as tabulated.

this figure and obtain the fuel storage space needed in cubic feet.

The following example is included to show how the formula given can be applied to an actual problem:

*Example:* What storage space would be needed for a heating season's supply of West Virginia lump, nut and slack coal for a Baltimore apartment house having 13,400 sq ft of steam radiation, neglecting coal required for service hot water, if the plant operates at 65% efficiency?

Solution: The degree days for Baltimore, normal season, are 4533. The design temperature in that city is 0F. Reference to Table 1 shows an average heating value of 14,000 Btu per lb for this coal. Inserting in the formula,

$$T = \frac{(13{,}400 \times 240) \times 4533}{(70 - 0) \times .65 \times 14{,}000 \times 67} = 342.5 \text{ short tons}$$

Referring to Table 1, since we do not know the exact proportions of the coal sizes, use 36.4 (third line, Semi-Bituminous) as the cubic feet needed per ton. Multiplying we find $36.4 \times 342.5 = 12{,}480$ cu ft required. If the coal is piled 10 ft deep, the area of the required bin would be 1248 sq ft.

In the case of a plant converting from oil to coal, however, the problem is somewhat simpler than when dealing in absolute terms, because the oil consumption during the corresponding past period is already known. In such cases the coal needed for a given period after conversion can be estimated easily by using the following formula:

$$T = G \times \frac{H_o \times E_o}{H_c \times E_c}$$

where

T = the tons of coal for the period,
G = gallons of oil for a corresponding period,

TABLE 2. STORAGE SPACE REQUIRED FOR AND HEAT CONTENTS OF WOODS AND MISCELLANEOUS SOLID FUELS

| Name | Space Required, Cu. Ft. per Lb. | Heat Value, B.t.u. per Lb., Dry |
|---|---|---|
| **WOOD** | | |
| Ash | .0337 | 5400 |
| Beech | .0328 | 5350 |
| Birch | .0320 | 5200 |
| Chestnut | .0475 | 5800 |
| Elm | .0412 | 6000 |
| Hickory | .0278 | 5400 |
| Maple, red | .0400 | 5950 |
| Oak, white | .0298 | 5550 |
| Pine, white | .0581 | 5850 |
| Pine, yellow | .0555 | 9200 |
| Walnut | .0320 | 4650 |
| **MISCELLANEOUS SOLID FUELS** | | |
| Coke | .03 | 12,500 to 15,000 |
| Charcoal | .07 to .10 | 11,000 to 14,000 |
| Peat | .016 to .14 | 7,000 to 10,000 |
| Hog fuel | .0256 to .0512 | Same as wood from which made |
| Sawdust | — | |
| Wet tan bark | — | 2,500 to 3,000 |
| Straw | .05 | 5,450 to 6,750 |
| Bagasse | — | 8,000 to 8,700 |
| Lignite | .0185 to .0208 | 11,000 to 12,500 |
| Sawdust briquettes | .0125 to .0133 | 8,000 to 8,200 |
| Shelled corn | — | 7,800 to 8,500 |
| Cottonseed hulls | .06 to .07 | 7,000 to 7,200 |
| City garbage | .023 to .025 | 7,000 to 9,000 |

TABLE 3. STORAGE SPACE REQUIRED FOR AND HEAT CONTENTS OF FUEL OIL

| Oil Standard No. | Space Required, Cu. Ft. per Gal. | Heat Value, B.t.u. per Gallon |
|---|---|---|
| 1 | 0.13368 | 136,000 to 139,000 |
| 2 | | 139,500 to 140,500 |
| 3 | | 141,000 to 143,500 |
| 4 | | 144,000 to 145,500 |
| 5 | | 146,000 to 148,500 |
| 6 | | 149,000 to 152,000 |

TABLE 4. STORAGE SPACE REQUIRED FOR AND HEAT CONTENTS OF MISCELLANEOUS LIQUID FUELS

| Liquid | Space Required, Cu. Ft. per Lb. | Heat Value, B.t.u. per Lb. |
|---|---|---|
| Coal tar | .0128 to .0169 | 16,000 to 17,300 |
| Benzene[1] | .0181 to .0185 | 18,170 |
| Ethyl (grain) alcohol | .0202 | 12,810 |
| Methyl (wood) alcohol | .0203 | 9,600 |
| Gasoline | .0212 to .0224 | 20,600 |
| Kerosene | .0197 | 20,000 to 20,500 |

[1]Not to be confused with benzine (gasoline).

$H_o$ = heat value per gallon of the oil used,

$H_c$ = heat value per ton (not per pound) of coal to be used,

$E_o$ = plant efficiency when burning oil, and

$E_c$ = plant efficiency when burning coal.

Where the plant is a very large one, or where a new plant is contemplated, Table 6 may be of use. It should be noted that this table applies only to the larger plants and the figures for heating boilers are not applicable to the small heating plants. In other words, Table 6 deals primarily with the type of plant usually called the power plant and not with the domestic heating system. The paper on which this table is based was presented ten years ago and for that reason may be somewhat dated. On the other hand, precise accuracy is not necessary in this particular problem.

## Storage Facility Design

In the case of the design of coal bins for both hand and stoker-fired boilers for furnaces of the domestic type, excellent publications are already available‡ which apparently answer every important question which might be raised on their subjects.

One point seldom mentioned in connection with coal bins is that of the loss of capacity due to an end or side being open, so that coal when piled slides at that end. Where this is a factor, the slope of the pile can be estimated by use of Table 5 which gives the sliding angles for various fuels.

In larger installations there is, as a rule, no particular need for any fancy design but here, as in the house, the problem is ordinarily one of finding sufficient space to store a large quantity of fuel. This problem can become acute with such buildings as apartments, as indicated by the example previously given, whenever the coal required for a whole heating season must be stored at once.

In still larger plants, such as in industrial plants, the larger apartments, hospitals, and so on, in addition to the space problem, spontaneous combustion must be considered. This will be discussed in the following paragraphs.

## Spontaneous Combustion

This matter is in many cases not too well understood by engineers not experienced in coal handling and, as the Bureau of Mines itself points out, exactly what happens to cause spontaneous combustion is not quite understood even by specialists in coal technology. It is usually sufficient to know, however, that (1) there is no danger of spontaneous combustion with anthracite coal and (2) there is no danger of spontaneous combustion in reasonably sized bins of soft coal where such coal is in large lumps. The danger is with soft coal stored in large piles, particularly where the coal contains a fairly large proportion of very fine fuel.

*Anthracite.* In a statement made January 28, Dr. R. R. Sayers, director of the Bureau of Mines, pointed out that the heating value of most coal suffers little from storage. Experiments have shown that higher rank coals (such as anthracite) lose only about 1.2% in heating value the first year and 2.1% in two years. Lower rank coals, Dr. Sayers said, have losses as much as 2% to 3% the first year and 5% in three years.

*Bituminous.* About two years ago the late O. P.

‡"Modern Anthracite Coal Bins," Bulletin M-3; "Gravity Ash Removal Methods," Bulletins MA-1 and M-2. These publications are available in limited quantities at no charge from Anthracite Industries, Inc., 405 Lexington Ave., New York, N. Y.

**TABLE 5. ANGLE OF SLIDING FOR COALS**

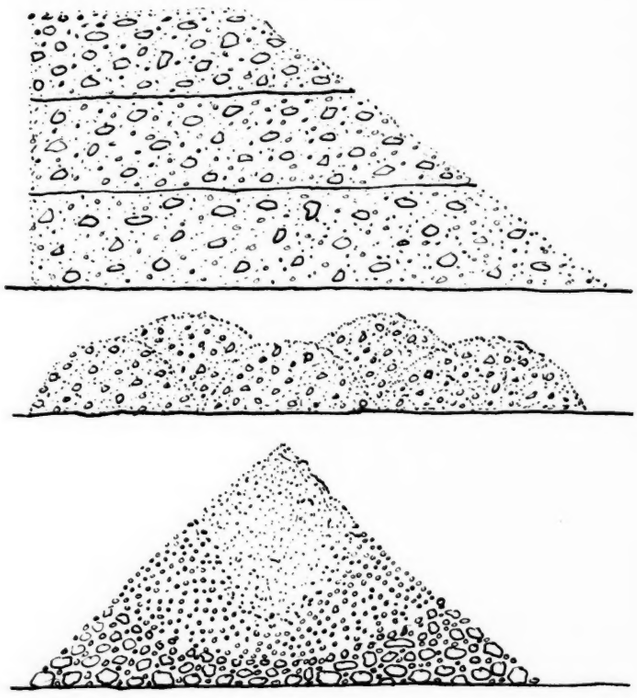
(Table for coal shows angle with horizontal at which coal will slide for coal on bright steel chute. In piles the angle of repose is somewhat higher than the figures below. Slight freezing can increase these angles sharply)

| Coal | Angle with Horizontal | |
|---|---|---|
| | Sliding Starts | Sliding Continues |
| **BITUMINOUS** | | |
| Illinois 6 in. lump | 21 50 | 20 40 |
| Illinois 3 x 6 in. egg | 21 00 | 19 10 |
| Illinois 3 x 2 in. lump | 20 30 | 19 00 |
| Illinois 1¼ x 2 in. nut | 20 40 | 19 20 |
| Illinois ¾ x 1¼ in. nut | 21 00 | 19 40 |
| Illinois slack | 25 40 | 22 30 |
| Oklahoma screenings | 24 00 | 22 30 |
| Oklahoma chestnut | 21 00 | 19 00 |
| Kentucky egg | 21 50 | 20 20 |
| **ANTHRACITE** | | |
| Pennsylvania egg | 15 40 | 14 00 |
| Pennsylvania chestnut | 16 40 | 15 10 |

**COKE**

(Sliding angles below are for coke on coke, not on chutes. High values are for dry coke, lower values for wet coke)

| Size | Sliding Angle | Angle of Repose |
|---|---|---|
| Furnace | 43 to 45 | 45 to 47 |
| Stove | 39 to 41 | 43 to 44 |
| Breeze | 37 to 40 | 41 to 44 |



*(Top) Correct method of piling coal, lumps and fines being well mixed and leveled off in 2 ft layers. (Center) Correct method of dumping coal, with lumps and fines well mixed. (Below) Incorrect method of piling coal, the lumps and fines being allowed to segregate.*

Hood of the Bureau of Mines prepared a paper on spontaneous combustion of coal in which he called attention to the fact that the risk of spontaneous combustion per ton of coal is very small. At that time he reviewed the subject of spontaneous combustion and showed that the preventive of this phenomenon is ventilation. The heating of coal is believed to be a surface action and when coal is broken up the surface is greatly increased. For example, if a ton of bituminous coal were in one solid lump it would have a surface area of about 47 sq ft; if this coal were then broken up so that it would pass through a 16 mesh sieve the area of exposed surface would be about one acre. Experience has shown that the sharp increase in extent of surface does not begin until the coal falls below 1¼ in. or nut size.

The action which takes place in spontaneous combustion is the combination of oxygen with the coal at the surface and as has been mentioned, this is inversely proportional to the size of the coal. The oxidation is also more rapid and more serious for recently mined coal than for weathered coals. Furthermore, moisture has an accelerating effect in causing spontaneous combustion. The danger point is at 120F, and when the temperature of the interior of the pile (as determined by a thermometer sunk in an iron pipe into the pile) shows that the temperature has reached 120F, action should be taken. As Hood pointed out, the temperature at which coal is piled, too, is important; coal put into storage at 80F is probably four times as prone to spontaneous combustion as coal placed in storage at 60F.

The following points should be kept in mind when storing soft coal:

(1) Pile so that lumps and the fine coal are distributed as evenly as possible. Do not allow lumps to roll to the bottom, forming air passages. It is a good plan to build the coal pile in 2- to 3-ft layers, leveling with scrapers after each layer has been deposited in order to prevent segregation of coarse and fine coal;

(2) If possible, store only screened nut coal. In any event, keep out dust as much as possible and reduce handling to a minimum;

(3) Provided air is either excluded or allowed circulation free enough to dissipate any heat generated, coal may be piled, theoretically, to any desired height without danger. In practice, however, to minimize danger due to careless piling, it is advisable to pile the coal to only 12 to 15 ft. By observing this precaution it becomes possible quickly to move the coal and to consume any section of the pile that shows a tendency to heat;

(4) Do not pile coal in very hot weather;

(5) Do not store near any external sources of heat, such as steam pipes;

(6) Inspect the pile regularly. A temperature of 120F represents the danger point for many coals;

(7) Since green coal oxidizes rapidly, allow at least six weeks seasoning before final storing;

(8) Avoid air leakage to the pile through interstices around foreign objects (such as posts and brick-work), or through porous bottoms, such as coarse cinders. The practice of ventilating with pipes may cause local overheating and often does more harm than good;

(9) Avoid alternate wetting and drying of the coal, as this may speed up pyritic oxidation;

(10) Do not permit old coal to accumulate in corners or on the bottom of bins or piles;

(11) Do not allow foreign combustible matter, such as oily rags and paper, to become mixed with the coal;

TABLE 6. SPACE REQUIRED FOR COAL-BURNING PLANTS PER NORMAL RATED BOILER HORSEPOWER OR PER SQUARE FOOT CATALOG RATING†

| Type of Plant | Coal Storage Capacity of Bunkers, Lb. | Cubic Feet of Space for | | |
|---|---|---|---|---|
| | | Boiler and Pump Room | Fuel and Ash Handling Equipment and Storage Bunkers | Total Plant |
| High-Pressure, Stoker-Fired, Water-Tube, with Mechanical Coal and Ash Handling Equipment, Overhead Storage Bunkers, Coal Delivered by Rail to Plant[1] | 356 | 76 | 54 | 130 |
| High-Pressure, Stoker-Fired, Horizontal Tubular, No Mechanical Coal and Ash Handling[1] | 640 | 137 | 19 | 156 |
| Low Pressure Heating, Portable Type Steel Firebox Boilers, Stoker- or Hand-Fired[2] | 500<br>4 | 45<br>0.36 | 15<br>0.12 | 60<br>0.48 |
| Low Pressure Heating, Cast Iron Sectional Boilers, Stoker- or Hand-Fired[3] | 6.75 | 0.23 | 0.20 | 0.43 |

†From a paper by L. A. Snider before the Second Midwest Power Conference.
[1]All figures are per normal rated boiler horsepower.
[2]Figures on upper line per boiler horsepower; lower line per square foot of catalog rating.
[3]All figures are per square foot of catalog rating.

(12) Sealing the top and sides of a large coal pile with an airtight continuous layer of fine coal, plus a second outside covering of lump to prevent wind and rain erosion, has been found practical and effective. Coatings of asphalt also have been used with success to preserve very large coal piles; and

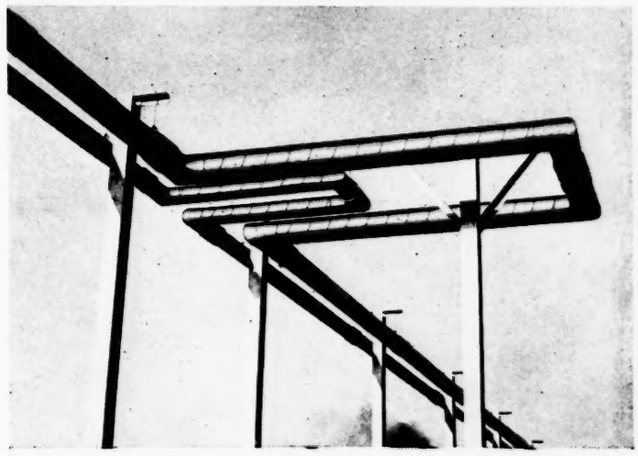
(13) When spontaneous heating has progressed to a great degree in a coal storage pile, the only thing to do is move the coal so that it can cool off, according to the Bureau of Mines. Using water to put it out may be effective for the moment, but in many cases it only delays the necessity of moving the coal.

# Overhead Line of Prefabricated Units

Use of insulated pipe units underground has become fairly commonplace due to the rapid acceptance of the idea of pre-fabrication which cuts to a minimum the field work on a given job.

However, these units also have applications overhead and in such cases the saving in time and cost and the reduction in hazards using pre-fabricated units, rather than working on elaborate scaffolding, gives the pre-fabricated unit many advantages.

The accompanying illustration shows a section of 1500 ft of insulated pipe units installed in place on channel steel upright supports, ready for connector bands and insulation between units, in two working days. The installation is in a defense project where several units were welded together and these welded sections were then hoisted into position eliminating the need of hoisting single units and attempting the welding overhead.



*Overhead construction using Ric-wiL insulated pipe units at a defense project. 1500 ft of these pre-fabricated units were employed as part of 18000 lineal feet of the company's units installed underground and overhead.*

# 150F Temperatures in Copper Mine

In order to increase America's supply of copper urgently needed in national defense work, the Magma Copper Company has just installed three new 140-ton centrifugal machines to provide air conditioning down to the 4,600 foot levels of its mine in Superior, Arizona.

This marks the third extension to the original air conditioning system, which was designed and engineered by Carrier, in 1937. At the time, the Magma mine was the first mechanically air conditioned mine in the United States.

According to Mr. Murphy, air conditioning the deep shaft to the 4,600 foot level is expected to increase the mine's capacity by deeper mining.

Unusually high rock temperatures have made air conditioning necessary in the Magma mine. Temperatures range from 127F on the 3,200 foot level to 150F on the 4,600 foot level. This new installation is expected to cut temperatures down to 90 degrees at the deepest workings.

The installation was supervised by C. B. Foraker, safety and ventilation engineer for the Magma Copper Company.

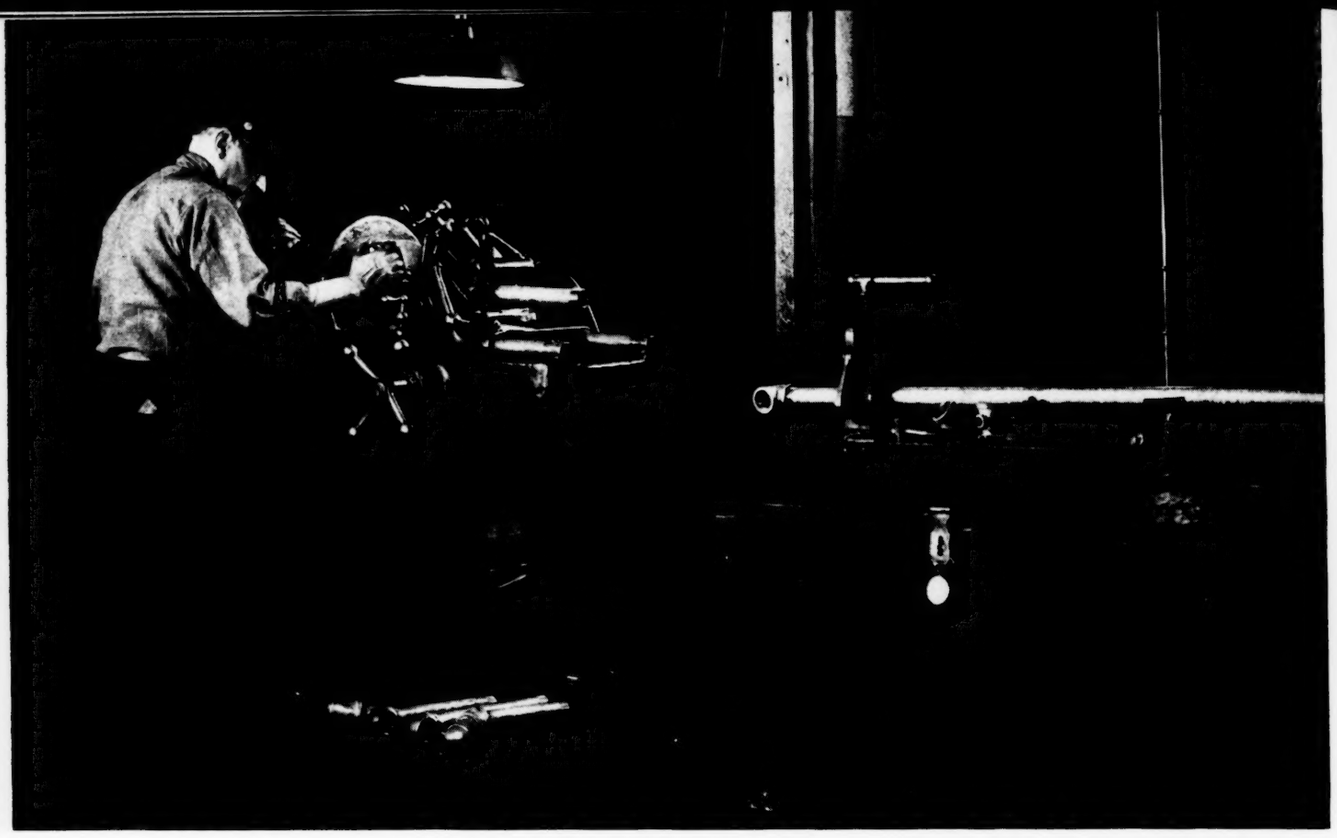


*Fig. 1. Portable pipe equipment. Pipe machine, tool box, and vise in portable forms so as to expedite work at point of installation.*

# Time Study on Pipe Fitting

IN order that management may more closely control its pipefitting costs and the men receive just compensation for their work, a measurement system has been devised at the East Pittsburgh works of Westinghouse whereby the complex variable time values for pipefitting in the plant can be compiled in chart and curve form for simple computation and application. It has been noted that under this new system there has been a decided decrease in supervision cost and the men have been able to increase their earnings through improved performance.

Extensive time studies were taken covering all

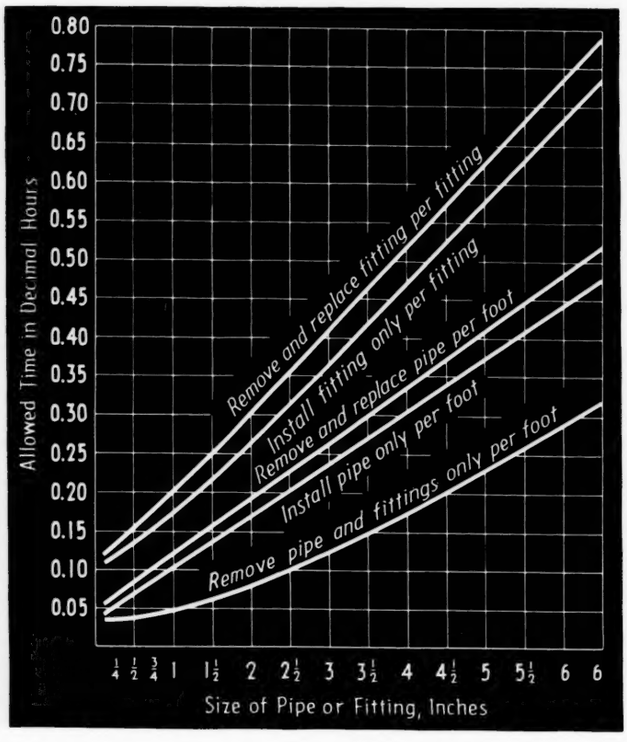



*Fig. 2. Chart showing allowed time plotted against the size of pipe or fitting, for operations performed when installing or repairing pipe lines in a ditch or at floor level.*

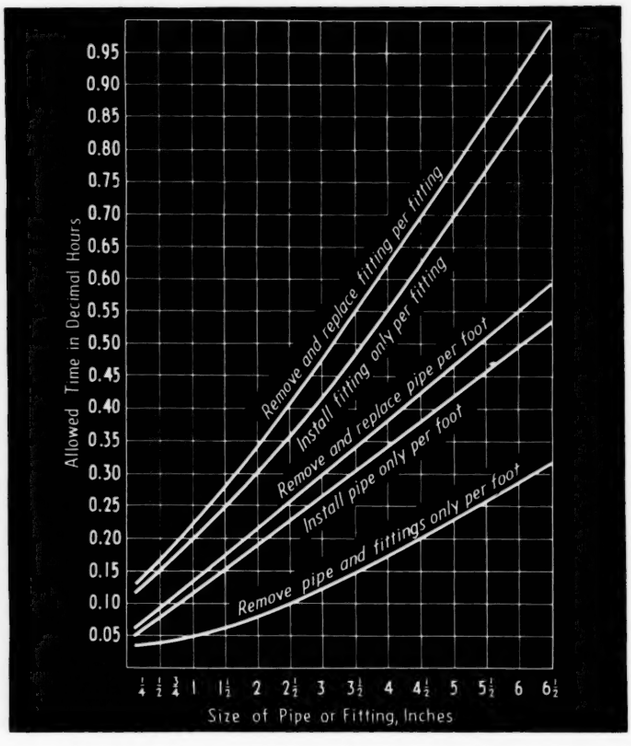
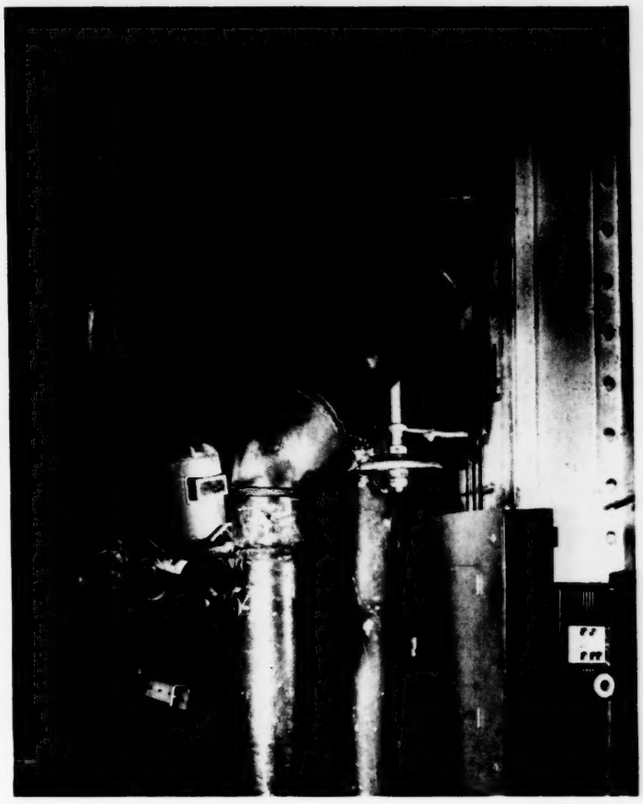



*Fig. 3. Chart of time allowances for installing, removing, replacing pipes when installing or repairing pipelines overhead.*

*Fig. 4. 45F offset welding. Westinghouse pipe-fitter welding 8-inch water main to provide clearance for new crane runway.*

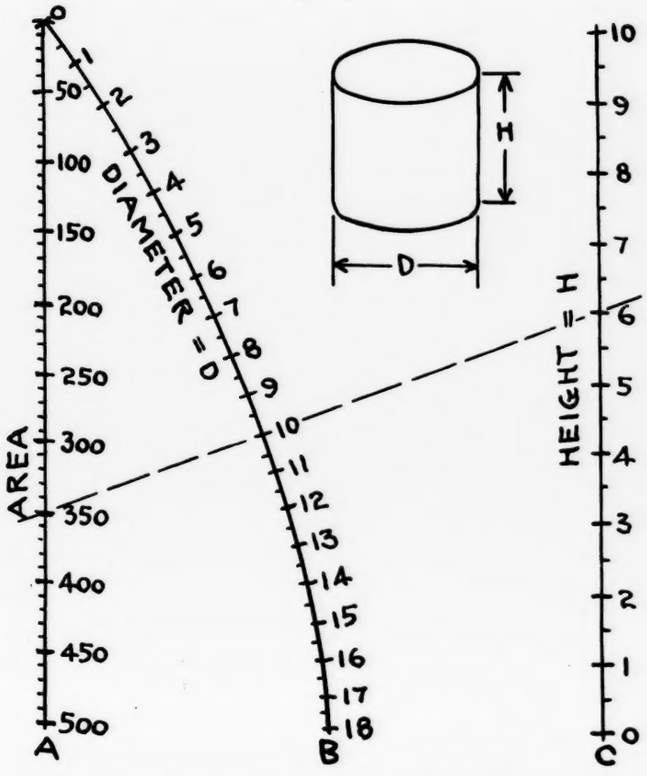


phases of the work and where possible standard methods for performing work were formulated. The three kinds of pipe handled, namely, standard, hydraulic, and cast iron, had a decided effect upon the cutting, welding, and threading time due to the various thicknesses, and a slight influence on the handling time due to the variances in weight. Other time studies were compiled for such variable factors as the diameter and length of pipe; the type of fitting; the location, whether in a ditch or under the floor, at floor level, or overhead; type, size, and gauge of the bends; outdoor weather conditions; amount of removal of old pipes.

To all time computed from the charts is added to cover the set-up time for collecting tools, equipment, and material and moving to the job as well as the time required on the part of the group leader for supervision and time-keeping standpoint.

## Cylindrical Areas in Heating and Ventilating Processes

In heating and ventilating processes we frequently deal with objects that are cylindrical in shape, such as tanks. It is often necessary to compute the areas of such objects.




The accompanying chart gives quickly the total number of square inches, square feet or square centimeters, of surface of any cylindrical object up to 18 inches in diameter, and of any length. The chart automatically adds the two flat ends and the cylindrical surface without any long hand figuring.

*Example:* The diameter of the object is 10 inches and the height is 6 inches, how many square inches are there in the surface?

Solution: The dotted line drawn across the chart shows how easily this is solved. The line passes through the 10 in the curved column B, and through the 6 in column C. The intersection with column A shows that the area is 350 square inches.

Of course any unit of measurement may be used. Thus if the diameter and length are in centimeters the area will be in square centimeters. If the diameter and length are in feet the area will be in square feet. It is therefore obvious that the chart will take care of nearly any cylinder.

In the event that the length or height of the object should be greater than given in column C, simply add the necessary length to column C and then proceed as above. Thus if the height is 20 inches and the diameter 5 inches, double the length of column C. Running a line through the 20 in column C, and the 5 in column B, it will be found that the total area is 350 square inches.—*W. F. Schaphorst.*

# Theory Vs. Practice

## Use of Insulation to Avoid Alterations to Heating Plant

By T. W. REYNOLDS

A FAIR sized book would be required to list all of the possible savings and advantages which may be obtained by various methods of insulating against heat losses. Much has been written along these lines, but there are some points in connection with insulation when applied on alteration work which do not seem to be kept readily in mind in this busy world. For example, a room which is inadequately heated and far from the boiler, or where the boiler is unable to carry more load, may in some cases be made comfortable by insulating the outer walls of the room rather than by doing the obvious and more usual things, such as adding radiator surface, changing the piping, or installing a new boiler at considerable expense.

Possibly the reader may recall several cases where judgment should be substituted for heating calculations. Take, for instance, the practice of increasing radiator size as compensation for a cold floor over an unheated space. In cases of this kind, no increase in radiation as shown by calculations will ever make the heated space as comfortable as it would be if the floor were well insulated. A cold floor increases the floor to ceiling temperature differential, a condition which increases convective currents, is uneconomical, and never makes for comfort in the occupied zone, while the heat piles up at the ceiling and fails to warm the floor to the extent desired. If the floor is not insulated, there is no other recourse except to add radiation and in such an event one should remember when making the necessary calculations that the usual overall coefficient for floor construction is correct only for still air conditions. The surface coefficient for wind must be added to the combination if the floor is exposed to all outdoors, a condition which incidentally is the hardest to meet for comfort except by insulation.

Many an attic expansion tank and its connecting pipes may have no insulation and in most attics none is required to prevent freezing where lath and plaster top floor ceilings pass the heat readily along, but wherever the attic has floor boards it is advisable to insulate the tank. If there is insulation below the floor boards the tank shall be well insulated, for the attic temperature will then fall to only 5 or 10F above the outdoor temperatures. Insulation on the tank is also desirable as a bare tank loses unnecessary heat.

Where the radiation on the top floor of a house is below requirements, and this is often the case, one should balance the cost of attic insulation against the cost of additional radiation; or where the heating is by hot water, balance against the cost of installing a circulator and converting the system to pressure. The advantages of lowered fuel consumption and of summer comfort should also be weighed.

An attic without floor boards is in particular need of insulation between floor beams, especially an attic which is devoid of any stored equipment, such as old rugs, trunks and the usual accumulation commonly stored in such places, and which provide a fair degree of coverage in themselves. Obviously, insulation can be more easily applied where there are no floor boards to take up.

Any leakage from the roof should be repaired before insulation is applied, as the insulation loses much of its value when its structure is broken down and packed by water, and also loses its full insulating effect when the non-conducting air spaces are squeezed out by packing as done by some householders. Insulation bats should be checked to see that there are no cracks left between them; ventilating louvers should be temporarily closed for the heating season by means of removable or hinged insulated covers; and all single partitions between attic spaces and adjacent rooms should be well insulated.

Insulation can often be used to advantage between floor beams over cold cellars which are without finished ceiling, over boilers whose heat may affect a thermostat on the floor above, the backs of concealed radiators and on the floor and roof of sun porches.

Good insulation has the advantage of economy, reduction of noise from without, summer-winter comfort, warmer walls in winter which do not chill one when sitting close to them, less temperature differential from floor to ceiling, which makes for comfort and economy and less infiltration, dust and cold drafts. Insulation should be supplemented by weatherstripping, especially on buildings of speculative construction, or those with loose fitting doors and windows where insulation alone would lose much of its value due to these conditions. Like insulation, weather stripping also prevents drafts, cold floors and the dust that comes with infiltration.

Theoretically, any heating contractor who advises a home owner on how to get by with a small sum of money, or who recommends the use of some heat saving device such as insulation as a means of providing comfort or reducing fuel bills, is turning away from his own field just that much business. Practically, this is not so, because as a general rule the home owner will forego the expense of correcting the faults of the heating system in his home if the expense of doing so goes beyond his means.

# PROFITS IN AIR

The new plant recently completed for the Hygrade Sylvania Corporation by The Austin Company is working day and night manufacturing fluorescent lamps. Underground concrete ducts distribute the air. See page 37

## HOW INDUSTRIAL PLANTS PROMOTE PROCESSES BY CONTROL OF AIR CONDITIONS

METALLURGICAL

FOODSTUFFS

ORDNANCE

CHEMICALS

AIRPLANES

FOUNDRIES

TOBACCO

TEXTILE

BAKERIES

ELECTRICAL

FILMS

INSTRUMENTS

GLASS

MACHINE SHOP

PHARMACEUTICAL

PLASTICS

PAPER

RUBBER

PRINTING

PROFITS IN AIR

# MUNITIONS PLANT

## costing seven million dollars installs 1350 tons of air conditioning in its machine shop to increase workers' efficiency and cut number of rejects

By GEORGE RUST†

AIR conditioning is furnished for the huge Machine Shop of a recently completed $7,000,000 munitions plant, located on a 330-acre site and comprising twenty-three buildings, with all utilities installed underground.

The Machine Shop is the largest building in the plant and is 300 ft by 500 ft, with a clear ceiling height of 14 ft. It is a windowless building and is completely air conditioned and lighted by approximately six miles of fluorescent tubes. The building houses four divisions, maintenance shops, machine tools and equipment, testing laboratory, and inspection and engineering offices, and is said to be the largest single air conditioned space in its section of the country. It is constructed with brick sidewalls and a flat tar and gravel roof applied over a steel deck and two inches of insulation.

†Rust Engineering Co., Birmingham, Alabama.

### Need for Air Conditioning

In the early stages of developing and planning the Machine Shop, it was estimated that the total connected motor and high frequency induction furnace load would be approximately 6000 hp and that the machines would operate on a relatively high diversity factor. Studies indicated that a building constructed with the usual saw tooth or monitor type roof would result in excessively high room temperatures during the greater part of the long summer season and that air conditioning afforded the only practical solution. It is felt that the improved working conditions afforded by

**The machine shop of the munitions plant, said to be the largest (300 x 500 ft) air conditioned space in its section of the country.**

air conditioning will quickly pay for the cost of the installation through higher efficiency of the workmen, improved quality in the product, and an expected reduction in the number of the rejects to be found during inspection. Another factor lending weight to the decision to air condition the building was that more than one operating shift was anticipated and the use of air conditioning made it possible to design a building of the windowless type. It is also felt that operating conditions will be improved through the use of uniform, high intensity fluorescent lighting, and as the lighting installation was required for night operation, the only added cost for daytime operation is the small quantity of energy consumed by the fluorescent lights.

### Twelve Zone System

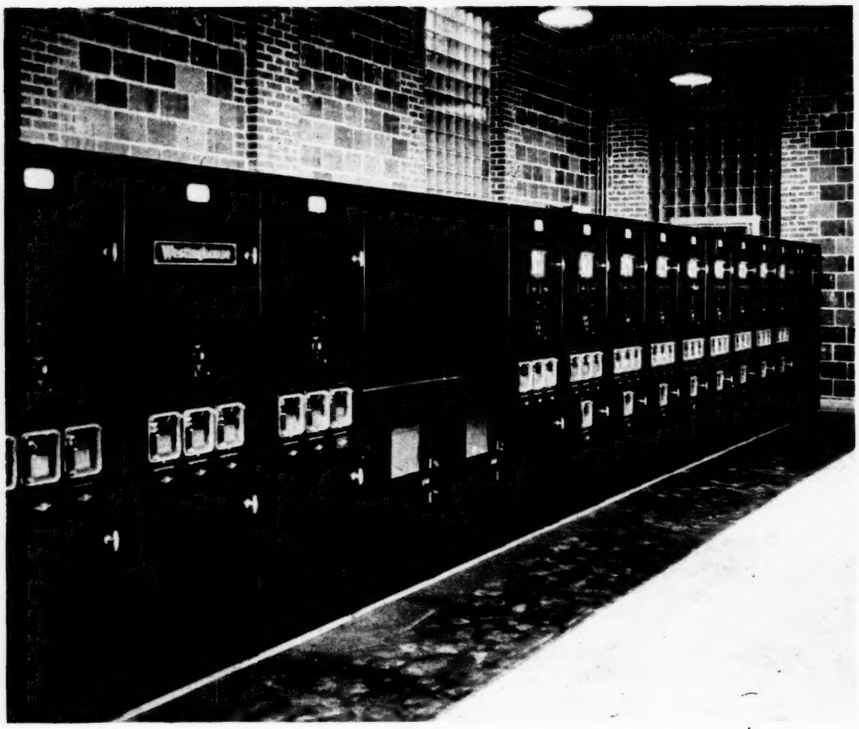
After careful study and consideration it was found advisable to air condition the building by using a number of identical and entirely independent zone systems. Briefly, the factors contributing to this decision were (1) decentralization of vulnerable equipment, (2) flexibility of operation, (3) the ability to operate a small portion of the plant in peace times, if desirable, (4) the higher salvage value of the smaller units should it be desired to dispose of or relocate them in other plants after the emergency, and (5) spare parts can justifiably be carried in stock for the smaller units.

The air conditioning equipment consists principally of twelve 16-cylinder Westinghouse Freon compressors direct connected to 100 hp, 440 volt motors. Under design conditions it is estimated that the compressors will develop a total of 1350 tons of refrigeration. Two compressors are mounted in each of six penthouses, uniformly spaced on the roof of the building. The compressors are located in a central room of the penthouse along with the Cutler-Hammer control panel, and the compressed Freon is conducted to Westinghouse evaporative condensers located on the roof adjacent to each end of the penthouse. Each end of the penthouse contains Air-Maze filters, fresh air and recirculating air dampers, a bank of direct expansion Young Freon coils, and an American Blower ventilating fan driven by a 25 hp motor. The fan draws air through the dampers and coils and discharges it into a duct system running directly under the roof deck. The air from each fan is discharged into the building through eight large ceiling Anemostat air outlets. The building space is thus divided into twelve zones, and each zone contains its own thermostat which controls the operation of the dampers, the fan, and solenoid valves in the liquid lines to the individual coils making up the bank. The control system was supplied by Johnson Service Company.

### Operation of Equipment

The two compressors in each penthouse normally operate in parallel and each coil bank is of sufficient size to handle 180 tons of refrigeration in the event the heat load is unbalanced due to the concentration of equipment in one section of the building. By closing three sectionalizing valves in the Freon lines and throwing one switch on the control panel, equipment in each of the penthouses may be divided into two entirely independent systems. This will facilitate maintenance work on one section of the machinery, or would permit partial operation. The compressors are equipped with built-in cylinder unloaders which operate to bypass half of the cylinders, enabling each compressor to de-

Six of the four evaporative condensers located on the roof of the plant.



Close-up of the main switch board controlling the power and lights in the plant.

liver 50% of capacity. Each refrigerant system, therefore, has a 4-step range when the compressors are operating in parallel, and a 2-step range when the compressors are operating separately. The zone thermostats operate to start the initial compressor and thereafter the compressors are controlled by suction pressure and the thermostats control the zone temperature by operating the solenoid valves on the Freon coil.

### Summer Design Conditions

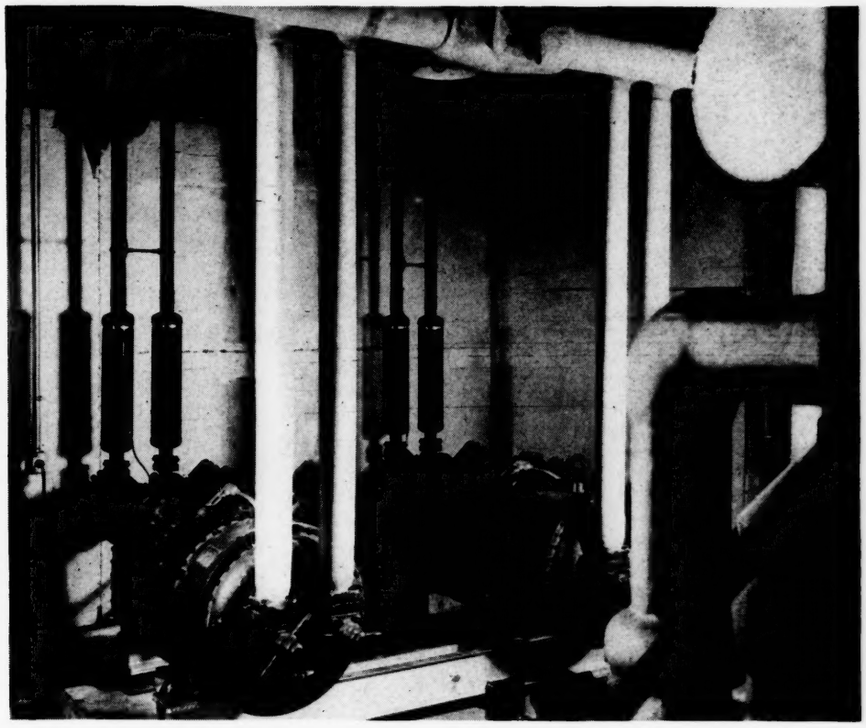
The air conditioning equipment is designed to handle 792,000 cfm or an air change every four minutes. With outside prevailing temperatures of 95F dry bulb and 78F wet bulb, and supplying a minimum of 60,000 cfm of outside air for ventilation, a room temperature of 80F and 50% relative humidity can be maintained during full plant operation. These conditions, combined with rapid air change, afford very comfortable conditions for men actively employed. This is estimated to be the extreme operating conditions that will be encountered. During cool or moderate weather proper room temperatures may be maintained without the use of the compressors by automatic operation of the dampers, blending outside and recirculated air.

### Heating

Winter heating is provided by means of six Pennco boilers having an output of 1,000,000 Btu each. One

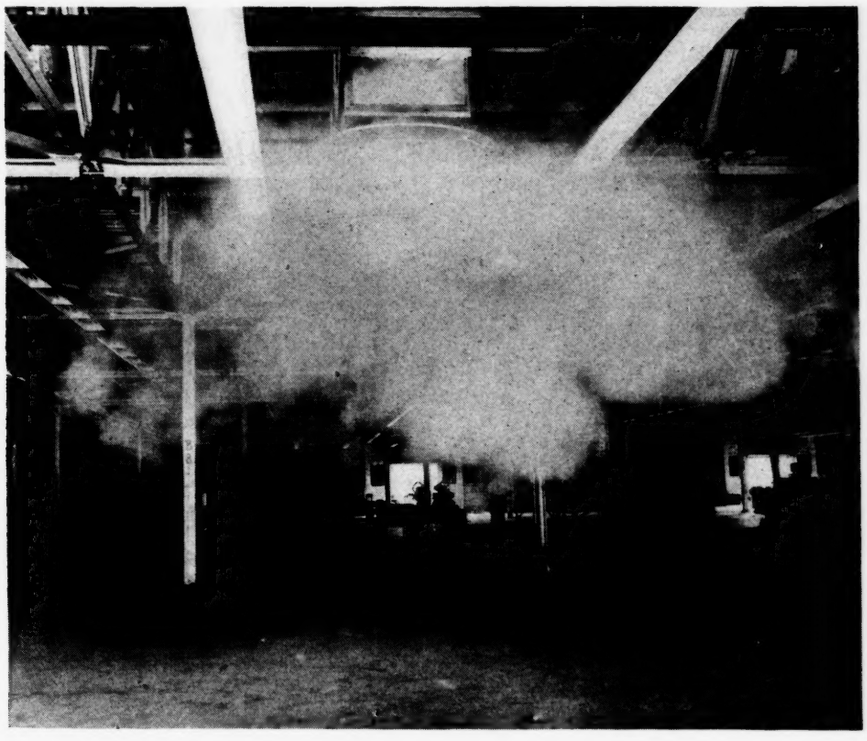
Air from each fan is discharged into the building from eight Anemostats, one of which is shown here.

Two of the twelve 100-ton Westinghouse compressors which are used for air conditioning the building.

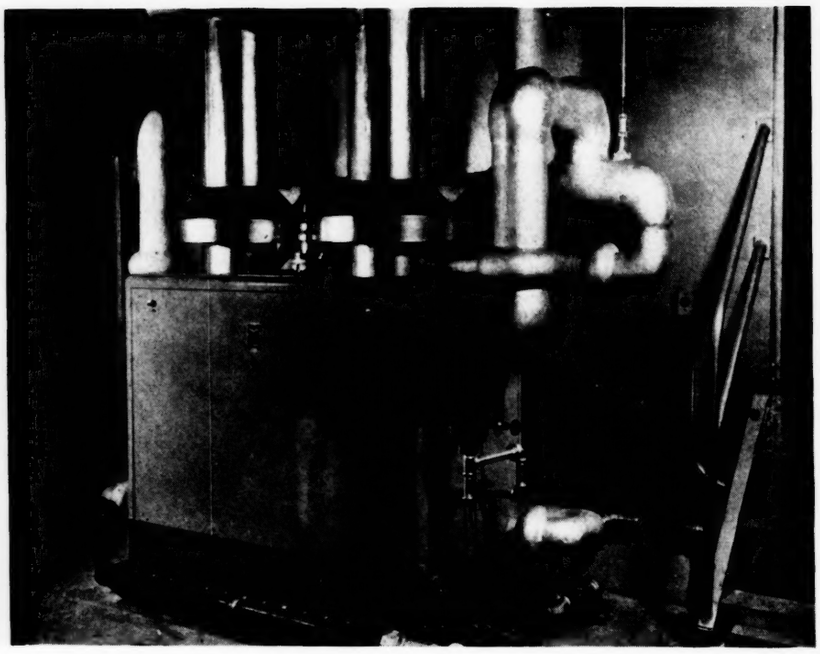


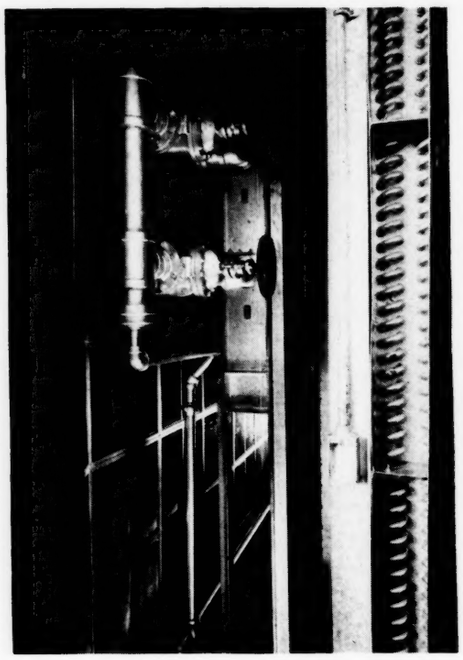
boiler is mounted in the central room of each penthouse along with the Freon compressors and, together with the Young heating coils, forms an integral part of the air conditioning equipment. Natural gas is used as the principal fuel with a propane system as a standby. The heating coils are installed in only one-half of the penthouse and when heat is required the fan on that side of the house is operated at reduced speed and the fan on the opposite side of the house is stopped. The boiler has sufficient capacity to maintain 68F within the building and it is estimated that with this reduced air motion working conditions will be very satisfactory. No humidity control is provided for winter heating. A night standby temperature of approximately 50F is automatically maintained by setting one switch on the control panel of each penthouse. During night operation, the low speed fan and boiler operate only when necessary to increase the temperature of the building.

Mounted in the sidewalls of the Machine Shop are 72 sets of exhaust dampers, controlled by four differential static pressure regulators. The regulators are set to maintain a slight positive pressure within the building. The dampers may be adjusted in groups to exhaust varying amounts of air at selected points along the building wall. By adjusting the dampers adjacent



Before the plant was completed smoke tests were run. This view shows such a test in progress with the smoke being diffused from the Anemostats.



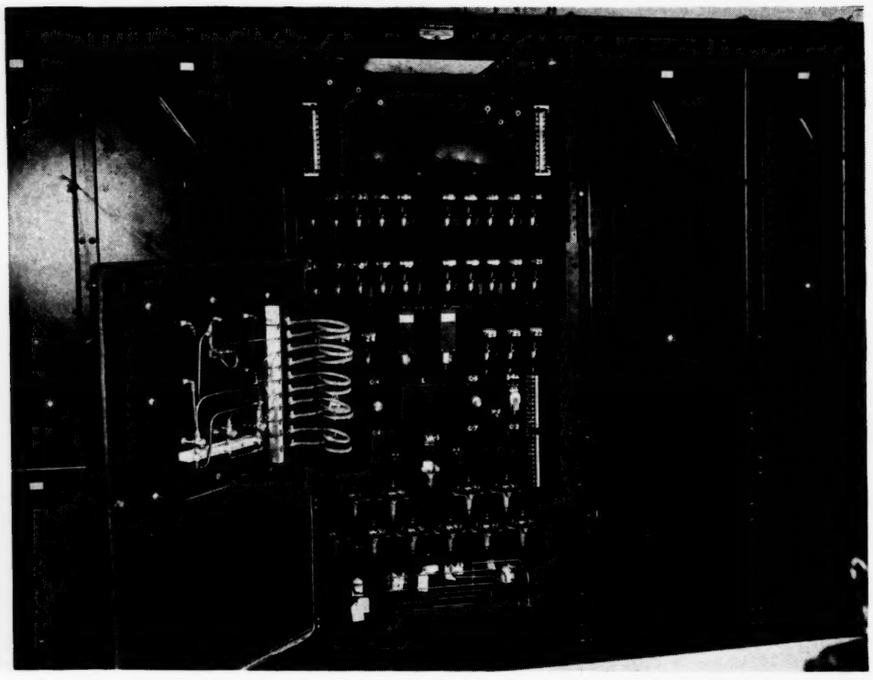


**(Left) Close-up of one of the six gas-fired boilers made by the Pennsylvania Furnace and Iron Company. (Right) This close-up view shows the coils and a bank of Air-Maze filters.**

to concentrated groups of operating equipment and thereby exhausting a larger portion of the available air, the air motion at that point may be increased, improving conditions in that area and reducing the average heat load carried back to the recirculating air dampers.

### Office Conditioning

A unique problem was encountered in connection with the rather large enclosed office space located at one end of the building. In order to maintain suitable temperatures in the main building space and absorb the heat from the operating equipment under certain conditions, the entering air is at a temperature of 60 to 65F. Air at this temperature could not be conducted into the office space and, therefore, it was necessary to install a booster heater to bring the temperature back to 68 or 70F. A direct gas fired heater was installed in a small branch duct leading off of one of the main duct systems, and the air from this heater is then piped to small Anemostats in the individual offices. An exhaust duct system and a central exhaust fan were also installed to insure positive ventilation of the offices. This auxiliary system, strangely enough, affords exceptionally pleasant conditions within the office space in that the reheating feature reduces the humidity of the entering air.



**The control board for the 1350 ton air conditioning system in the machine shop.**

# PROFITS IN AIR

## Raymond Laboratories, Inc.

### over a 5-year period has installed a total of four dehumidifiers to reduce moisture in its permanent wave pad manufacturing space, cuts losses to 1%, operates the year round, and assures sound product.

By MILTON FIGEN

THE leading product of Raymond Laboratories, Inc., St. Paul, Minn., one of the nation's ranking producers of preparations for the beauty salon trade, is a heating pad used in machineless permanent waving. This pad consists of a powdered chemical compound which, upon the addition of water, generates the heat necessary in the process of permanent waving. There is danger of deterioration of this chemical if excessive moisture is present in the air, so that it is desirable to hold the relative humidity to a maximum of 30%. For this reason, primarily, a dehumidifier was installed. Other considerations involved, though of lesser importance, were reduction of dust content in the air and provision for ventilation.

The system is a dual one. The first unit, a No. 6 bed-type, gas-activated silica gel dehumidifier was installed five year ago. A second unit of the same description was added later and the two hooked up in series so as to provide a total of 600 cfm of air to the conditioned area. Shortly afterward a No. 27 bed-type unit, providing 1350 cfm was installed in parallel with the two smaller units. These three units today constitute a separate system controlled by a single humidistat located in the conditioned area.

Last summer still another unit was purchased, a modern No. 29, 2,900 cfm capacity rotary drum type, to provide for additional service required as the result of enlargement of the factory working area. This unit operates as a separate system and is controlled by an individual humidistat though functioning in the same area as the three units comprising the first system.

The two systems together provide 4550 cfm of conditioned air to a working area of 30,000 cubic feet, thus offering one complete change of air in the factory every six minutes.

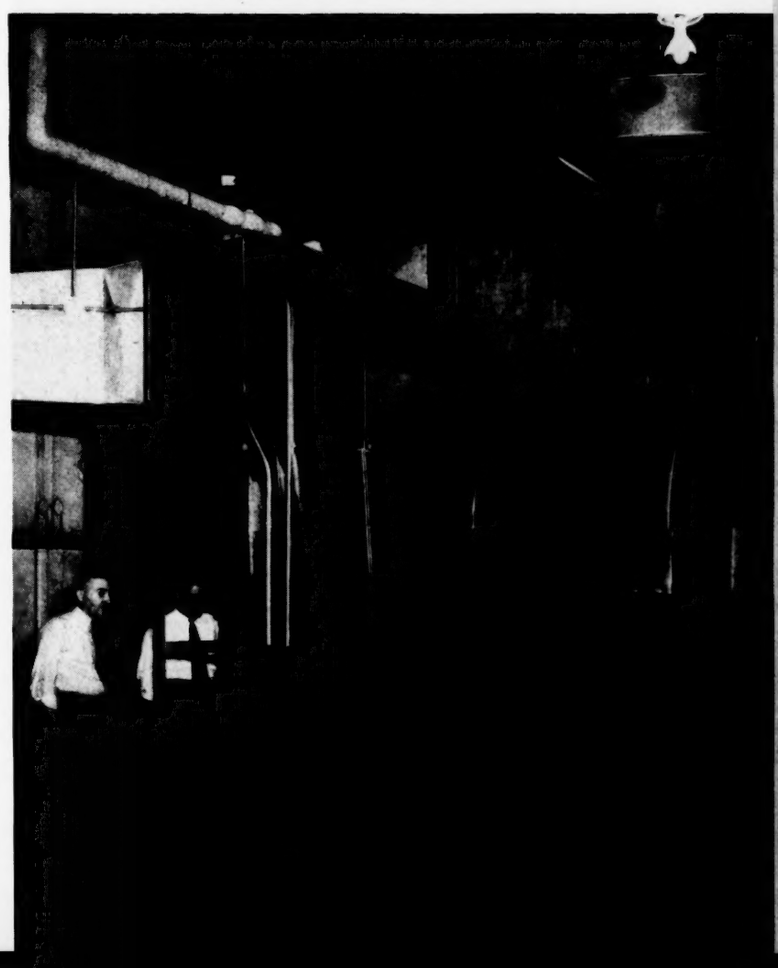
Either system may be shut down during emergencies for repairs without materially affecting the maintenance of desirable conditions.

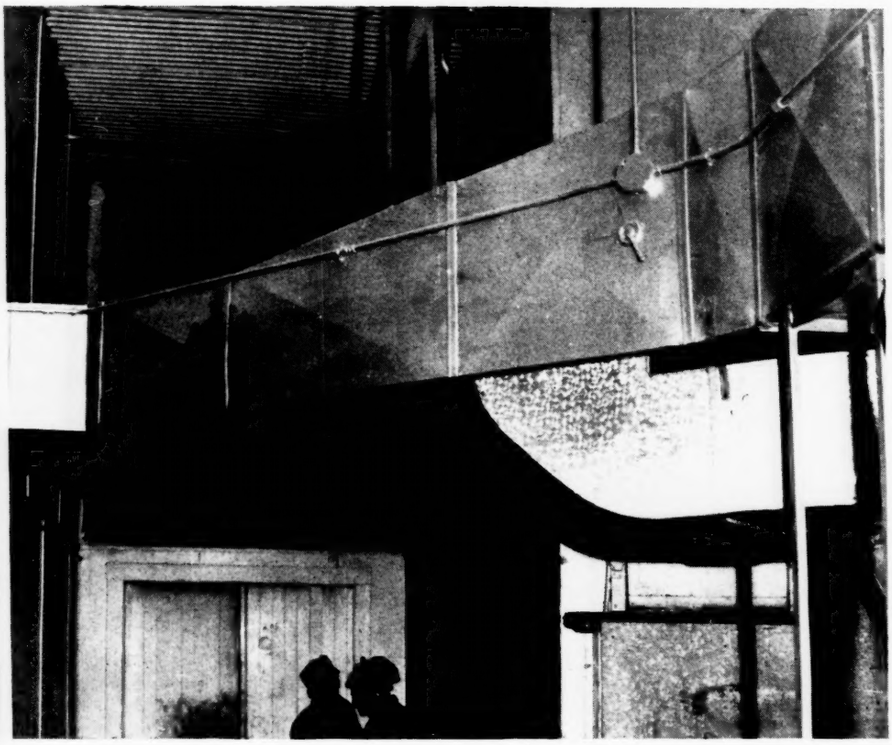
The air conditioning is used only in the summer when the relative humidity of outside air, often running 75% and above, would be ruinous to the chemical used in the manufacturing.

Outside air is introduced into the systems through filters which clean the air and cut down the dust. Precooling, generally, is used to increase the capacity of the humidifiers. The cooling is by well water which has a temperature of 54F on entering the coils and 70F leaving. Between eight and ten cubic feet of water per hour are used. From two to five grains of moisture are removed from air through this pre-cooling.

The temperature of air as it leaves the silica gel dehumidifiers averages between 95 and 100F. In order

**The No. 29 silica gel unit in the Raymond Laboratories. Stanley C. Watson, production engineer of the Laboratories is shown on the left. On the right is R. H. Whitesell, manager of the Bryant Gas Heating Company of Minneapolis, installers of the system.**





**Part of the ductwork from one of the silica gel units. In addition to the No. 25 unit the plant also has two No. 6 silica gel units and a No. 27 unit.**

to bring this down closer to a comfort level for factory employes, the air from the larger units is passed through well-water-cooled coils before delivery to the conditioned areas. As a rule the delivery air temperature runs between 75 and 80F when the outside air is approximately 95 to 98F, though maintenance of constant temperature was not one of the design conditions to be met in the installation. This does not necessarily mean that the conditioned space temperature is kept at this figure, because of the heat from lights, motors, conductions through the walls, and people, tending to raise the room temperature.

The No. 29 dehumidifier, as previously noted, is of the modern rotary type. The two No. 6's and the No. 27 each are equipped with dual silica gel trays and dampers for automatically switching the air from one set of trays to a second set every ten minutes. Although of 2700 cfm capacity, the No. 27 unit provides only half this amount of air for delivery because 1350 cfm of the air, after passing through the unit and a cooler, is returned to mix with the fresh filtered outdoor air entering the unit. The other 1350 cfm is discharged into a plenum chamber, together with the 600 cfm from the two No. 6 units, at the inlet of a fan which forces the air from all three units through a common duct system for delivery to the conditioned area.

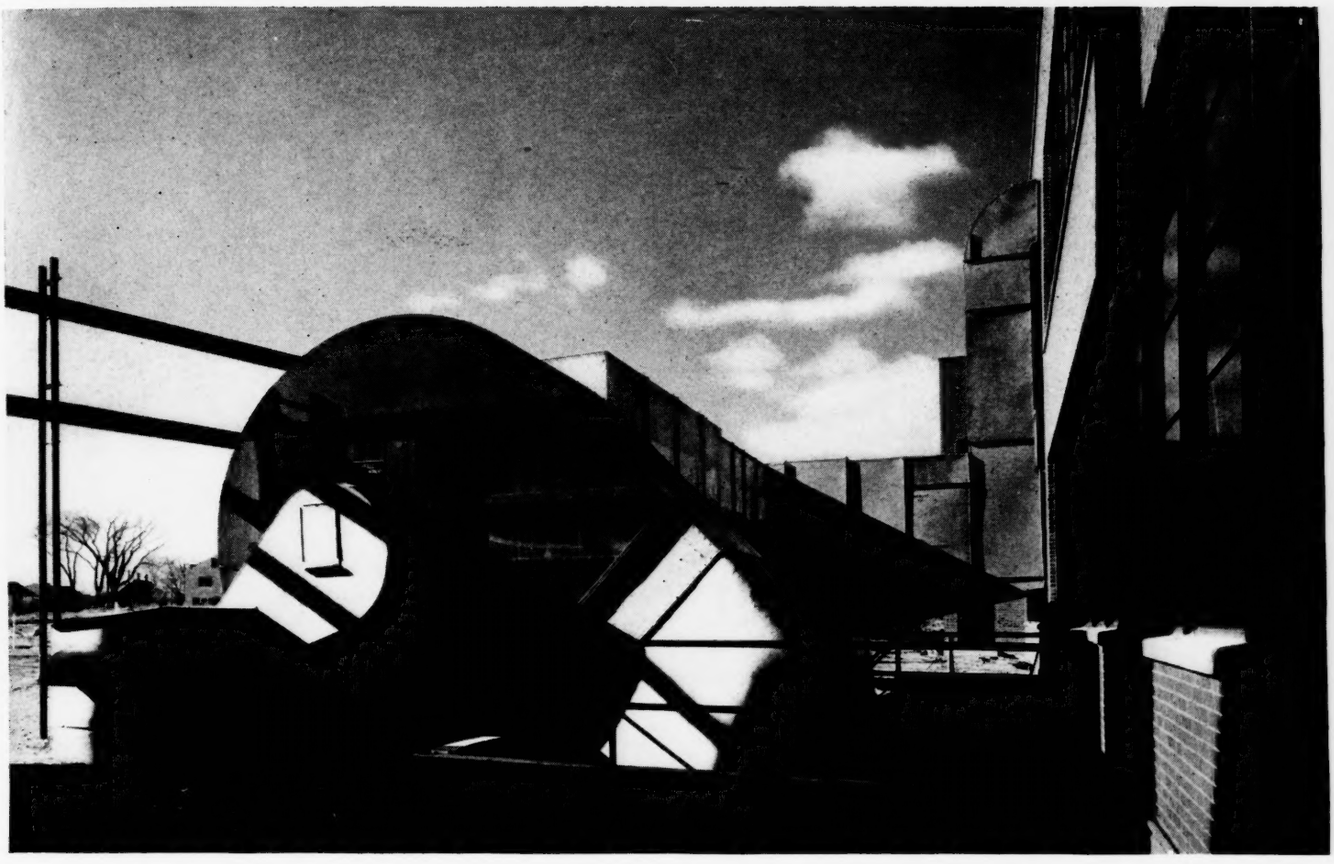
The manufactured space is kept under a slightly positive pressure to prevent infiltration of untreated air through doors, offices, and windows. The amount of air exhausted, together with the fresh air introduced, is sufficient to provide adequate ventilation for employes as well as control of the dust produced by the process carried on.

The following are typical comparisons of test readings. They were taken July 1, 1941 and cover the operation of the last unit installed. The day was not a warm one.

| | Dry Bulb, F | Wet Bulb, F | Moisture, Gr. per Lb. | Rel. Hum., % |
|---|---|---|---|---|
| Outside Air ..... | 67 | 59 | 62 | 58 |
| Ingoing Air ..... | 61 | 56 | 58 | 76 |
| Delivery Air ..... | 70 | 52 | 28 | 27 |
| Room Condition .. | 76 | 56 | 35 | 25 |

While figures on the costs of operating the system and the savings it has afforded the Laboratories are not available, Stanley C. Watson, production engineer for the firm, has pointed out the economic soundness of the installation. Dehumidification of the air in the premises wherein the particular products of this firm are manufactured is a basically essential part of the processing, due to the nature of the chemical materials employed. Protection of these materials from deterioration certain to result from excessive humidity is vital both in their raw and finished states. Before installation of the silica gel equipment, manufacturing of heating pads acceptable to the trade was confined to seasons of low humidity, and 100% certainty of the product reaching the user in proper shape was not assured.

The steady growth of the firm over the past five years to a point of leadership in its field enjoyed today could not have been possible without installation of effective means of humidity control, Mr. Watson pointed out. This control insures a moisture-free stable product which, vacuum packed, can be stored for long periods if necessary. It insures continuous production through twelve months of the year, and has cut losses to a fraction of 1%. And, finally, it insures user satisfaction, that indispensable prerequisite to the establishment and maintenance of good will and business success.



**The air washers and filters in the ventilating system for the Hygrade Sylvania Corporation are mounted back of this Buffalo fan. After washing and filtering, air is distributed through concrete ductwork underground.**

# Hygrade Sylvania Corp.

## in its new fluorescent lamp plant employs reinforced concrete pipe up to 8 ft. diameter for underground ducts for conditioned air.

ALL fluorescent lamp production for the Hygrade Sylvania Corporation is now located at the new 105,000-square-foot plant recently completed by The Austin Company, engineers and builders. Already operating, the plant is capable of turning out an average of more than 100,000 fluorescent lamps per day to meet the increased requirements of windowless factories and other defense plants.

A special ventilating system designed to maintain dust-free conditions and comfort temperatures throughout the plant is featured by the extensive use of reinforced concrete pipe. Fresh air is washed and filtered in a series of chambers at ground level outside the building proper, where hot water lines and deep well water will be used for central heating and cooling. The air is distributed through an underground system of 400 ft of concrete pipe in sizes up to 8 feet in diameter. This has been laid in the ground and covered by the fill underlying the concrete floor.

Ducts leading directly from this network of pipe have been brought up alongside the first floor columns with outlets about two feet above the floor at each level. The air is partly recirculated through return ducts to the central system or exhausted by 36-inch ventilating fans of 15,000 cfm capacity above the main manufacturing area. Air from bakers and from the coating room all on the first floor is exhausted direct to the outside by a network of overhead ducts.

A large maintenance shop completely equipped; a pump room, where air compressors, special controls for regulating pressure of incoming gases and other equipment, are located, as well as a boiler room in which two 150-hp stoker-fed boilers and a small hot water heater have been located, are in a wing adjoining the main manufacturing area.

Power enters the plant through underfloor ducts and is distributed from three independent transformer stations alongside the plant. Power is transformed from 2400 volts to 115 volts for lighting which requires 500 kva. Additional power is required to serve a large bank of machines on which fluorescent lamps are subjected to life tests on various circuits. Power required for general manufacturing is transformed from 2400 volts to 230 volts for operating purposes.

# High Pressure Heating Boilers

By FRED D. MOSHER

PROBABLY in no other line has there been as revolutionary progress as that in steam generation during the past two decades; the tempo of this progress was stepped up rapidly during the past ten years when the depression of the Thirties brought with it the necessity for greater economy in the generation of steam. While the term *boiler,* due to popular usage, will undoubtedly remain with us for many years to come, modern high capacity steam producers are no longer called boilers but are referred to as *steam generators.* And pushed into the realm of obsolescence is the term *boiler horsepower* (which came into use when "high pressure" boilers operated at 70 lb per sq in.), an expression no longer used by boiler builders; today the capacity of a boiler is expressed in thousands of pounds of steam.

The modern steam generator is the result of painstaking, intensified research and development on the part of industry and manufacturers. The demand by users for higher efficiencies and lowered costs in the production of steam, and the willingness of builders to meet the demand, has had really amazing results. The power industry offers the best example of what has been accomplished through improvements in boiler design. In 1914 4 lb of coal were required to produce one kilowatt in the most efficient plants; in 1942 numerous plants are delivering power at the rate of 1 lb of coal per kilowatt. Steam pressures in boilers have now reached a high of 2500 lb and steam temperatures of 950F are becoming common.

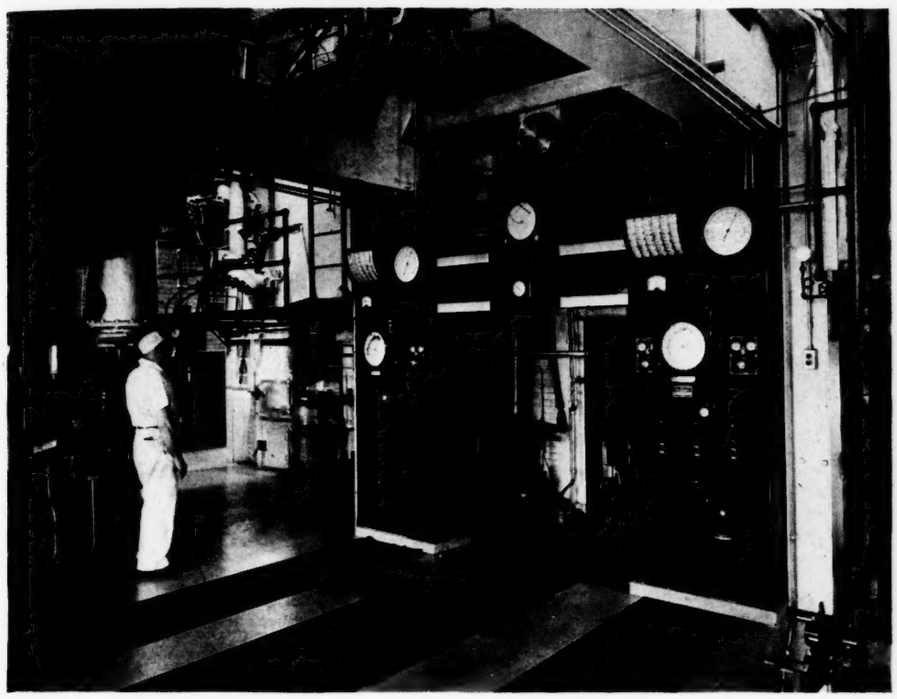
In order to do the things it has done the boiler manufacturing industry, of necessity, has depended on developments in many other related fields. The science of metallurgy has contributed enormously to the progress of boiler improvements by the production of alloys and high-tensile steels. Without welding the present day high duty boiler would be impossible and much of the credit for refinements in the technique of welding must be given to the metallurgists. Improvements in fuel burning equipment had to run parallel to improvements in boiler design. Automatic combustion controls—the ever-vigilant, inanimate attendants of the boiler room—have contributed materially to the success of the high pressure steam generating unit. Feedwater technology has solved many of the problems which presented obstacles to the successful operation of modern boilers.

High pressure boilers are adaptable to every locality and industry regardless of the fuel to be used. In the past two years a number of stations built by the Government for defense purposes have been equipped with high pressure heating plants ranging in capacity from 100,000 to 300,000 lb of steam; these plants are spread from one end of the country to the other and furnished with various kinds of fuel. One of the outstanding high pressure installations was put in service in 1941 when the great housing project, Parkchester, was opened in New York City. Parkchester, the world's largest center of its kind, consists of a group of 51 buildings all heated exclusively by high pressure steam; the heating plant is made up of four 450 pound pressure boilers each having a capacity of 135,000 lb per hour each. The Parkchester boilers are showing efficiencies as high as 87% when operated with oil; pulverized coal can also be burned in the plant should it be found desirable. To further demonstrate the flexibility of the boiler plant at Parkchester, provisions have been made for power generation if the occasion arise, although at the present time the boilers are being used only for heating.

New boiler plants being installed in industries requiring large quantities of process and heating steam are usually of the high pressure type. The multiplicity of processes required in many manufacturing plants makes it necessary to supply steam at various pressures and temperatures which is accomplished through stepping down from high pressure boilers through desuperheaters and reducing stations; in such installations the heating loads may be supplied from various sources such as exhaust, extraction, or straight reducing from boilers.

The rapid plant expansion made necessary by the war effort has shown the many advantages of high pressure steam where buildings are erected remote from the existing plant. In such cases high pressure superheated steam can be distributed for great distances at little loss; heating and process steam mains are one and the same. An example of this kind of distribution is found in the turbine manufacturing industry where large amounts of steam are required for testing and for heating of machine and assembly shops. A typical section of this kind of industrial plant is located over one-half mile from the steam generators and receives steam at 200 lb pressure and 100F superheat; at the receiving end the steam is reduced for both process and heating.

The modern high pressure steam generator is of welded construction and usually equipped with a superheater, and often furnished with an air preheater and economizer. Water-walls, an integral part of all large high pressure units, are fast becoming standard in the design of smaller industrial boilers. The advantages of these water-walls are many. The water-walled furnace may provide as much as one-half the total heating surface of the generator. Water-cooled furnaces permit high heat liberation and high flexibility in the use of the unit. It is safe to say that the development of the water-cooled furnace made possible the success of the super steam generator which is now in common use. Furnace maintenance is reduced to a minimum with the use of water-walls because heat absorbing surfaces are presented to the intense heat

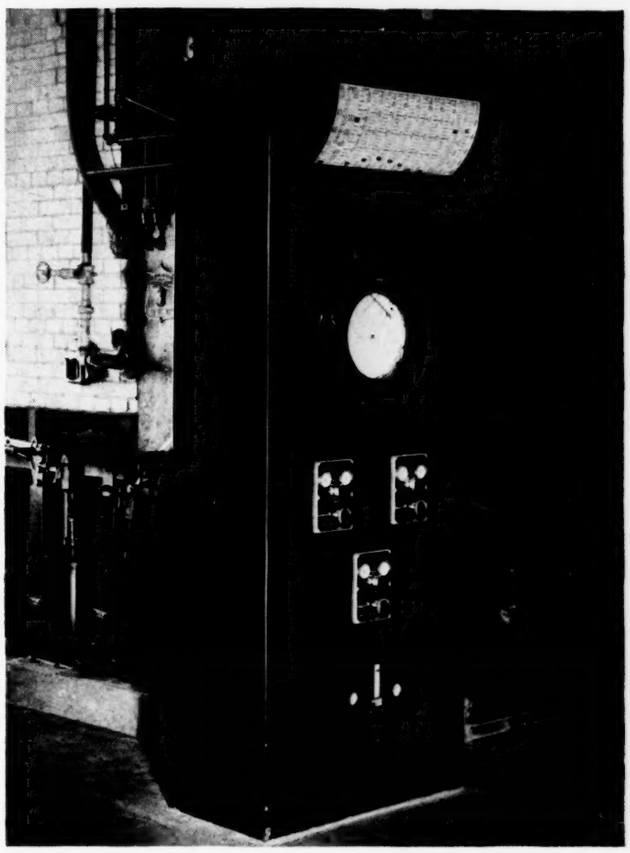


*Automatic controls show savings in the operation of small as well as large high pressure boilers. Two high pressure pulverized coal-fired boilers of 35,000 lb steam per hr capacity. Fuel preparing and burning equipment are controlled automatically.*

instead of refractory walls. The successful burning of pulverized coal was made possible through the use of water-cooled furnaces which permit intensive turbulence for mixing, not at all possible, because of the damage it would cause, in a refractory-walled furnace.

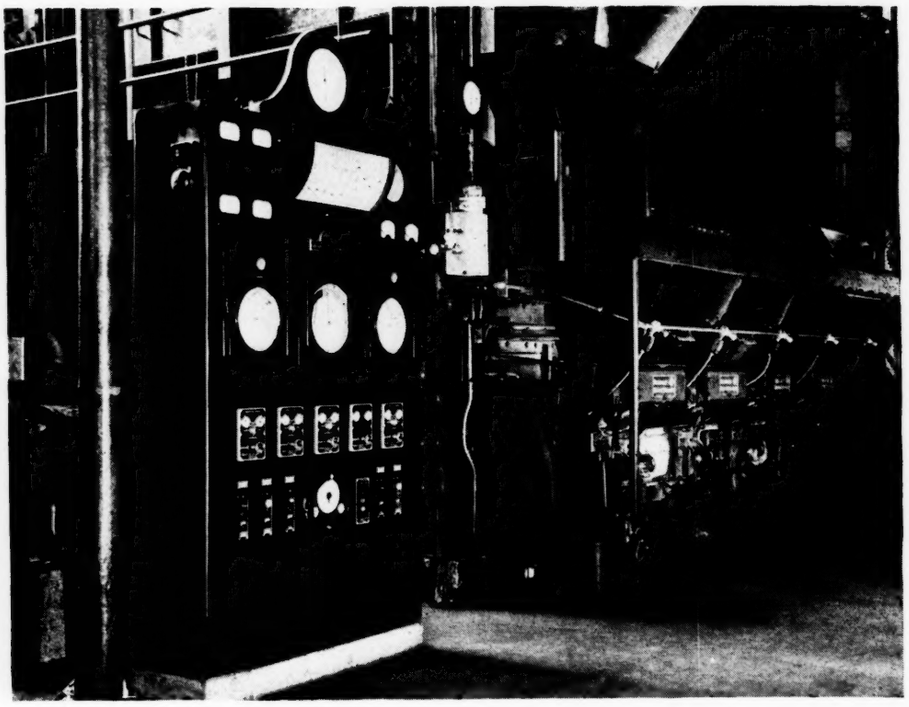
Economizers installed in the exit gas path of boilers increase boiler efficiencies by reducing stack heat losses with the additional advantage of providing high temperature feedwater for the boiler. To further increase the efficiencies of high pressure units, air preheaters are used to extract additional heat from the gases of combustion. Preheated air also speeds up the rate of combustion of the fuel and permits use of wide ranges of the lower grades. In general, economizers and air preheaters add to the perfection of the boiler and fuel burning equipment and enhance the attaining the ultimate possible in the efficiency of the steam generator. Thus it can be seen that there has been no "freezing" of designs by boiler manufacturers; on the contrary, modern boiler builders have adapted their designs to the needs of industry, and it is for this reason that pressures and capacities are determined, within the attainable limits, by the user.

Fuels for high pressure boilers range from wood and acid oil sludge to pulverized coal and gas. For the most part the "usual" kinds of fuel burned in industrial boilers have not changed with time, but the utilization of fuels in the lower grades has increased with the use of high pressure units. This is particularly true of pulverized coal burning which is one of the most popular methods used for high pressure steam generation. Pulverized fuel burns like gas, and because of this, good control of fires can be maintained and lighting is a simple operation. Practically any coal can be powdered and used with success in a furnace designed for such burning. In pulverized coal installations changes of grades of coal can be made without changing operating conditions. The uses of various grades of fuel by industrial steam generators is one of the distinct advantages of high pressure steam for heating and process purposes. New ideas in fuel burning have been part and parcel of the advance in boiler design and manufacture.

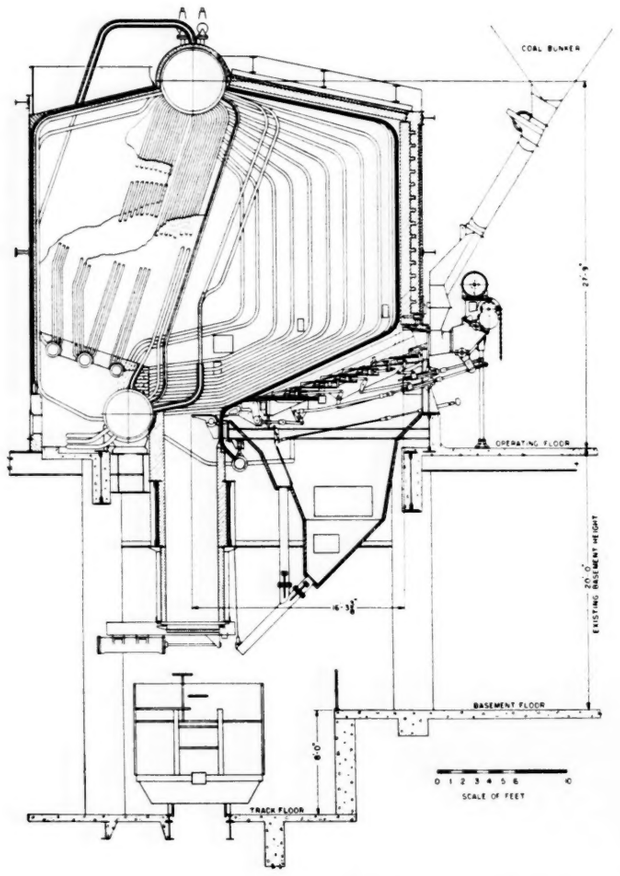


*Flexibility of the modern high pressure boiler is demonstrated by this Stirling unit which burns coke-oven gas and is also stoker-fired with coke breeze. Both fuels are handled by the controls mounted on the panel.*

*Low grade coal is used in this stoker-fired mid-western plant. The boiler operates at 410 lb pressure, producing a continuous output of 100,000 lb of steam per hr.*



Pulverized fuel burning has made possible the very large capacity units found in the utility power field, but this form of fuel burning is used in boilers of all sizes. Two types of systems are used in pulverized coal burning—the bin system and the direct system. With the bin system, the coal is powdered in separate preparing plants and fired from storage tanks or bins. In direct pulverized coal burning installations the coal is powdered in mills directly connected to the boiler through pipes. The direct system requires that the coal preparing equipment be operated any time the boiler is in service and delivering steam. Direct pulverized coal firing is rapidly replacing the bin system from which it is an outgrowth.




*A modern 1123 hp B & W boiler with a 10-retort Taylor stoker.*

The modern pulverized coal burning unit has demonstrated that rapidly changing load conditions can be met adequately and efficiently. The direct system of powdered coal burning is designed in such a manner that it can be operated through automatic controls, and many units are installed with all operations inter-connected and functioning through such controls.

Multiple fuel burning is now common practice in boiler operations. Many pulverized fuel burning boilers are adapted for oil burning in the same furnace without change of any kind; a third fuel, gas, is often added when the location of the plant makes it desirable to do so at certain times. As far as can be learned there is not a single fuel being produced today that cannot be successfully burned in the furnaces of modern steam generators.

The principal stokers used in industrial plants are the underfeed and the overfeed types. The drawing shows a section through a stoker-fired, high pressure boiler used for power, process, and heating purposes. The stoker shown is an underfeed, multiple-retort type equipped with water-cooling tubes to permit the burning of low grade coals. Before the development of the water-cooled stoker it was extremely difficult to handle many of the low grade coals in boilers of high ratings; stoker maintenance was high and outages were quite frequent.

The chain-grate, overfeed stoker will undoubtedly continue for a long time to be the choice of many users of coal burning boilers. The chain-grate stoker is one

of the oldest mechanical stokers in the steam generating industry, and it has been improved to such an extent that it offers a combination of simplicity and flexibility which is desirable in large numbers of industrial plants.

In the face of records piled up by mechanically fired boilers, it goes without saying that the days of hand-firing in industrial plants are numbered, and hand-firing for plants of any size is open to question. Apart from the fact that it is physically impossible to hand-fire a boiler of large capacity, the waste of fuel due to low efficiencies is a serious objection to the method. The average hand-fired boiler does not show an efficiency that cannot be improved by mechanical firing. Stoker fired boilers show efficiencies up to 85% and higher. Pulverized fuel, oil, and gas burning units give the highest efficiencies in high pressure units.

Progress is still being made in the art of burning fuel in steam generators and there is no indication yet that the end has been reached or even in sight. Whatever is done in the future to improve boiler efficiencies will without doubt put stress on improvements in combustion and fuel burning. Present trends indicate that there is little likelihood of any "new" industrial fuel being produced; however, it should be expected that new methods of handling old fuels will be found as time goes on.

Where steam is supplied by large central heating plants, high pressure boilers are ordinarily used. High pressures permit the transportation of steam for long distances and the elimination of multiple heating installations in a single plant. Large modern boilers operate at efficiencies from 70 to 90%, which allows steam to be transported to the point of use at losses that still keep the overall efficiency high. High pressure permits smaller pipe lines, resulting in lower first costs.

Where the plant requires process steam consideration should be given to a high pressure unit for the total load including heating. By using the full capacity of one high pressure unit, full advantage can be taken of the high efficiency at which it operates; the high pressure unit requires no larger operating personnel than does the low pressure boiler. Ordinarily, a survey will show that the concentration of load on a single high pressure unit will tend to increase the over-all plant efficiency so that operating costs will be lower.

The single high pressure unit with its flexibility of operation can be made to produce the necessary quantities of steam required through various ranges of pressure that may be needed in the many processes involved in manufacturing plants, and at the same time this flexibility permits a balance in load conditions which results in low costs for heating steam. The high pressure unit when used for power generation will also show operating economies in the costs for heating steam, particularly where exhaust or extraction heating is used.

Many engineers consider fuel conditions the principal point to consider in the selection of boilers. This fuel factor may have to be given extra weight in the days ahead because of the dislocations caused by the war emergency. In this situation, however, the modern high pressure boiler will show up favorably because of its ability to handle a variety of fuels. The wisdom of selecting a boiler because a number of fuels can be used with it has been demonstrated many times; this factor alone might easily be the deciding one. Problems in industrial plants vary with the product being produced, and often with the location of the plant, but regardless of the industry it is the desire of owners to produce steam at the lowest possible cost attainable. Especially in the cases where the steam is used for both process work and heating, high pressure steam should be given careful consideration.

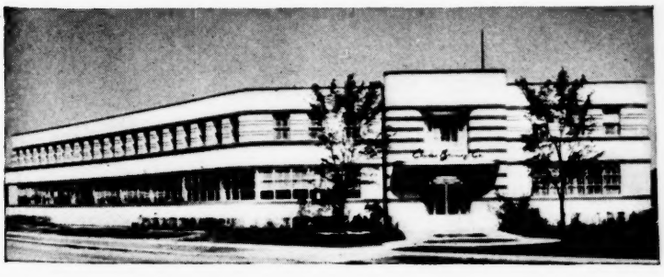
## Air Conditioning for Bruning Plant

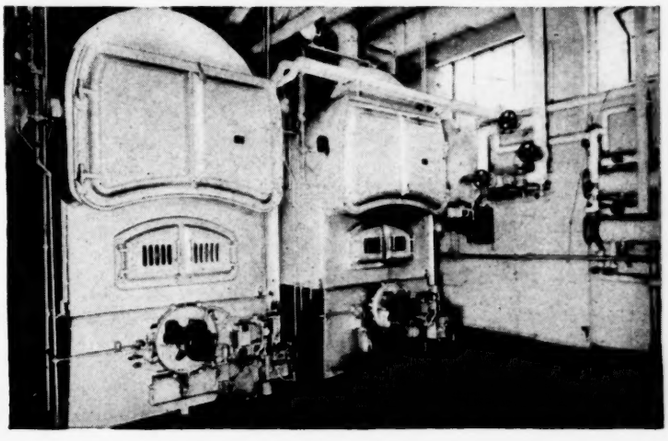
Charles Bruning Co., Inc., 4700 W. Montrose Ave., Chicago, recently completed a new plant. The building provides general office and manufacturing facilities for sensitized paper and printing and developing machines used in the Bruning BW direct printing process. Victor L. Charn was the architect.

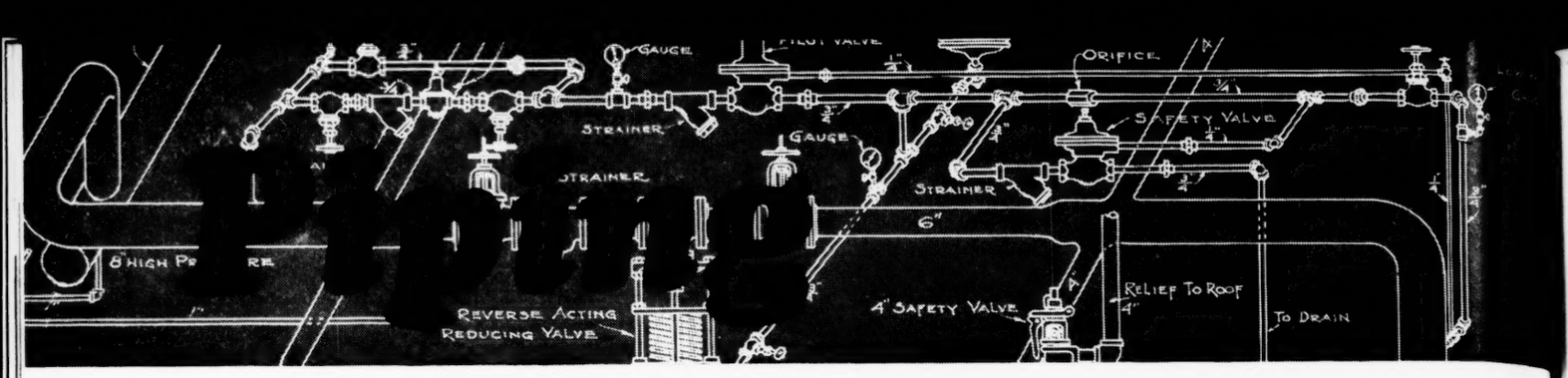
The air conditioning plant, located immediately adjoining the main stairway of the building, is fully automatic and serves the entire office force, providing clean, washed and dehumidified air in summer and properly humidified and warmed air in winter.

The factory is heated by projection type unit heaters under automatic control. The boiler room, located below the first floor coating department, is equipped with two large boilers, either one of which is capable of carrying a full load for heating as well as processing needs. The boilers are oil-fired and burn a low grade fuel oil. There is a fully enclosed 12,000-gallon fuel storage tank.

*The Bruning plant in Chicago (below) and (right) the oil fired boilers.*








# The Case for Welded Fittings vs. Miter and Intersection Welding

By G. F. SHERMAN†

THOSE engineers who are responsible for the design, operation and maintenance of piping, are sometimes faced with the question of choosing between factory made welding fittings and the fabrication, on the job, of elbows, tees, reducers and caps by welding. The question also occasionally confronts the piping contractor, although with less frequency, because it is so often decided in advance by the engineer who prepared the plans and specified for the job.

In making a choice between factory made welding fittings and on-the-job fabrication a number of considerations must be taken into account. Such considerations fall naturally into the three broad classifications of strength, efficiency, and economy; obviously, the importance of any factor or any group of factors will vary according to the type of job. On high pressure, high temperature steam installations, for example, economy runs a poor third in importance for the major considerations are strength and efficient operation; cost is given attention only after specifications have been drawn to assure construction that will answer the primary requirements.

In certain other types of jobs strength, permanence and efficiency may be of lesser importance and cost may become a principal consideration. Unfortunately there are too many piping jobs in which primary importance is attached to cost and, just because pressures are low, insufficient attention is paid to those factors which have to do with the long, trouble-free and efficient operation of the system.

Since we are not here concerned with the relative merits or costs of welded piping systems as against those which are installed by means of threaded and flanged joints we shall dismiss this subject without comment except to observe that in general welded piping is stronger, tighter, lighter, more efficient, longer lived and usually less costly than that erected by the older method.

For the purposes of our discussion we shall therefore assume that the welding method has already been selected and that it is now only a matter of deciding whether to use manufactured welding fittings or to permit the making of direction changes by miter welding and of branch connections by the intersection welding of branches into mains.

†Taylor Forge & Pipe Works, Chicago, Ill.

It is particularly difficult, if not entirely impossible to achieve full pipe strength without the use of properly designed welding fittings, so reinforced as to take the additional stresses which are imposed by reason of shape. In the case of elbows fabricated by miter welding bursting stresses are extremely high in the crotch section. Theoretically the stress at the crotch of a single-weld miter elbow approaches infinity. Actually the high stresses existing in this area are transferred to adjoining sections, which are already carrying their share of the load, and hence the entire crotch zone becomes a region of much higher stress. An examination and a little thoughtful consideration of the sketch, Fig. 1, will illustrate this point.

Fig. 1 represents a single-weld miter elbow. Consider what would happen if the pipe were cut along the dotted lines and there were some means of sealing the ends of the elbow against leakage without providing any restraint to movements of the walls. In other words disregard the restraining effect of the means used to seal the ends.

It will be seen that the metal at the crotch approaches the vanishing point as the cut is moved closer to the crotch, and as the cross sectional area of

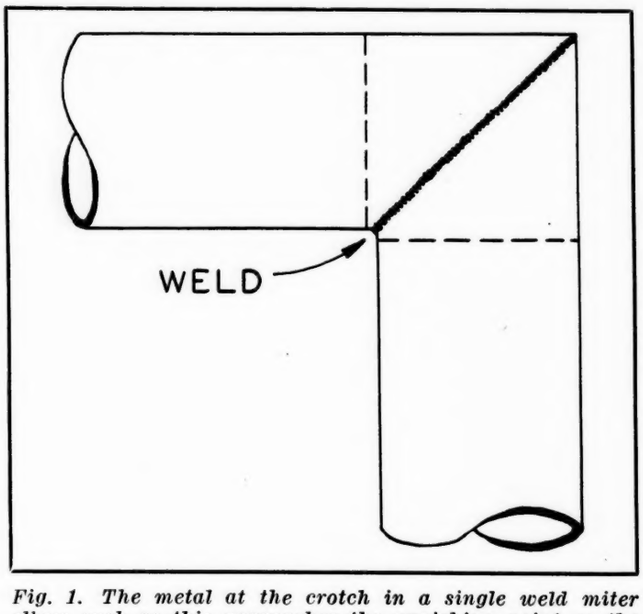



*Fig. 1. The metal at the crotch in a single weld miter elbow such as this approaches the vanishing point as the cut is moved closer to the crotch.*

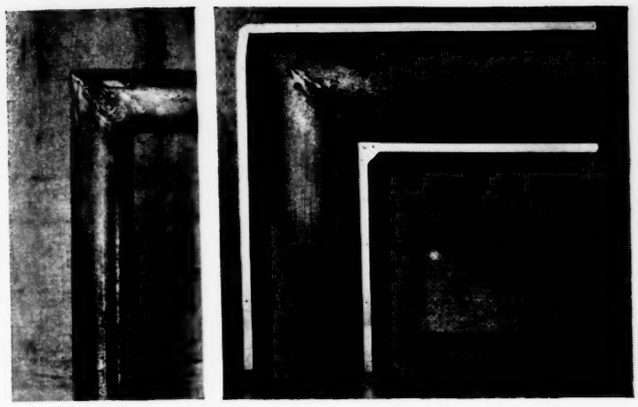


*Fig. 2. Inside and outside views of single weld 90° miter elbow. Fairly common in the early days of pipe welding. this construction is seldom tolerated today. Note poor penetration at crotch in picture showing inside of joint.*

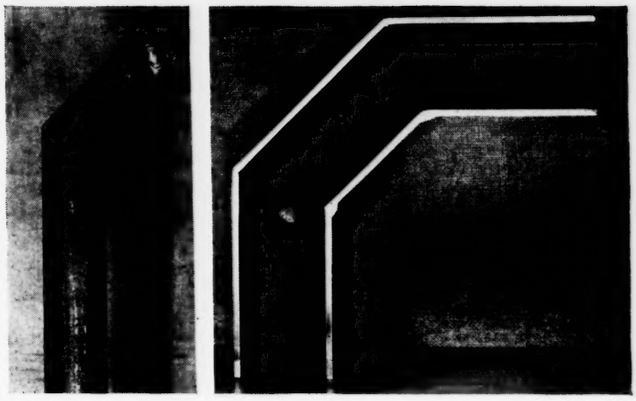


*Fig. 3. Inside and outside views of two-weld miter elbow. While this offers an improvement over the single weld turn. it still leaves a great deal to be desired, due to the unsightly and unmechanical appearance of the construction.*

the metal is reduced the stress becomes greater and greater. As the metal at the crotch becomes a point the only resistance to pressure within the elbow is the stiffness of the metal and the slightest pressure, theoretically, would open up the elbow at the point of minimum cross sectional area. In effect it is the same as a chain having links of varying strength and, finally, one with almost no strength.

Practically, of course, the more highly stressed sections begin to yield immediately upon the application of pressure and the load is taken up progressively by adjoining sections. It is apparent, however, that the pipe in the immediate vicinity of the crotch is stressed far more than either straight pipe or regions of the elbow near the back; that is, sections farthest from the crotch.

Another type of stress which, from a practical standpoint, is of an even more serious nature, is that caused by line movements due to temperature changes. It is so obvious that these stresses are highly concentrated at the welds that comment scarcely seems necessary. It should, however, be noted that the tearing action that tends to open up the weld at the crotch under certain conditions occurs at the point where it is most difficult to get good penetration and provide a first class weld.

From the standpoint of strength, intersection welding for branch connections instead of using properly designed welding tees, is an even more unsound practice than miter welding. Under bursting pressure a highly concentrated stress condition exists around the opening in the run pipe, and while the condition is so complicated as practically to defy both mathematical analysis and exact experiment it is generally believed to be maximum at the intersection of the top of the run pipe wall with the wall of the branch. Stresses up to twice those existing in the straight pipe are believed to exist in this area, the extent of the stress depending to some degree but not largely upon the relationship between run and branch sizes.

Added to this undesirable condition is the fact that few cuts are more difficult to perform with good results than those required properly to prepare the end of the branch and the hole in the run. The angle of bevel must constantly change and, unless extreme care is exercised the end of the branch will not accurately match the hole. At points where the spacing is too wide there is the ever-present danger of getting icicles of weld metal within the pipe, later perhaps to break off and damage valve seats, turbine blades, or other valuable equipment. At other points the welding edges may be too close, thus preventing proper fusion and resulting in a weak joint.

Mechanical stresses are also likely to be high because of line movements and the intersection welded joint is no better prepared to meet these stresses than those due to internal pressure. The reinforcing sad-

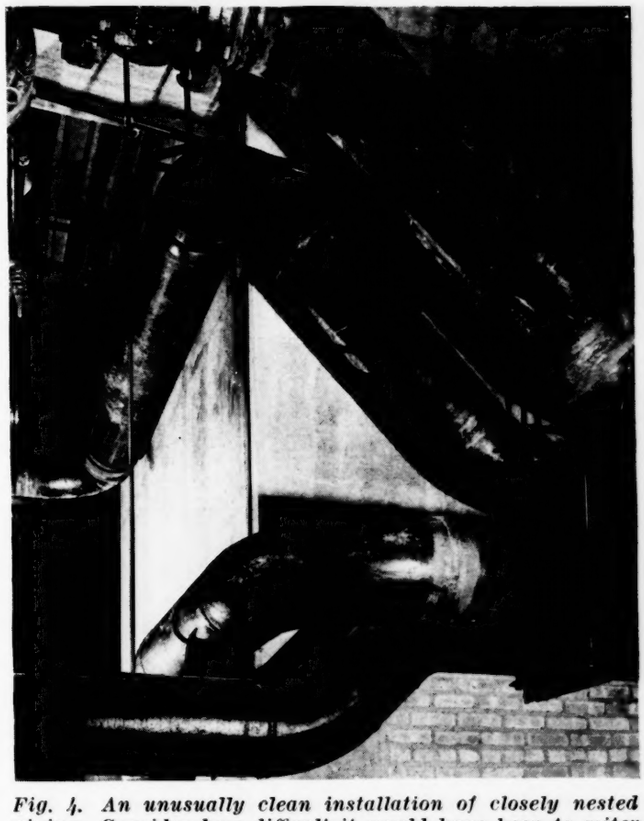


*Fig. 4. An unusually clean installation of closely nested piping. Consider how difficult it would have been to miter weld this job and how it would have looked miter welded. The lines are 12 in. and 14 in. sizes.*

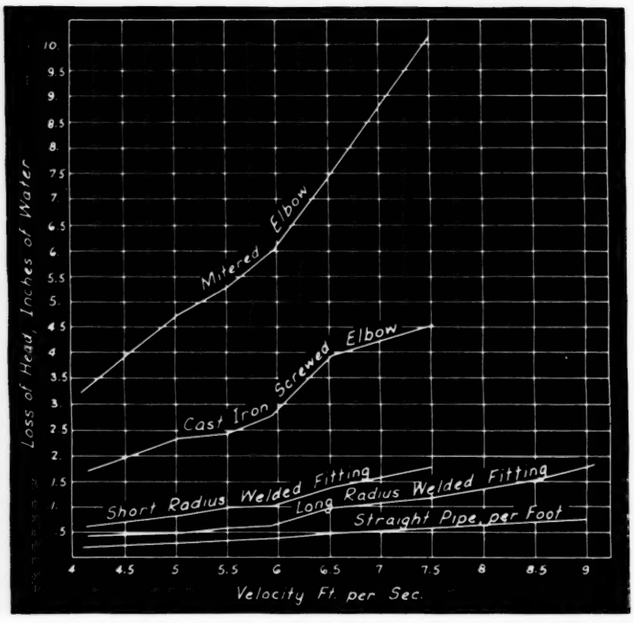

Loss of Head, Inches of Water
Velocity Ft. per Sec.
Mitered Elbow
Cast Iron Screwed Elbow
Short Radius Welded Fitting
Long Radius Welded Fitting
Straight Pipe, per Foot

*Fig. 5. Chart showing the frictional resistance of straight pipe, long and short radius welding elbows, a screwed elbow and a single weld miter elbow. While the chart covers only the 3 in. size, relative differences in resistances of the different fittings is about the same for all pipe sizes.*

dle sometimes used to strengthen intersection welds no doubt helps against mechanical stresses but requires a great deal of excess welding that is avoided when welding tees are used. It is also quite difficult to evaluate the strength of the saddle reinforced intersection weld because of the possibility of stresses being set up by the welding itself.

The same factors apply in varying degrees when considering the differences between manufactured reducers and caps as compared with those made up by welding. In general, when strength is important few people indeed will attempt to make their own fittings.

Likewise, when efficiency is a serious factor, as it should be in practically all cases, manufactured welding fittings will nearly always be used. By efficiency, of course, is meant the loss in head due to the frictional resistance of pipe and fittings. Inadequate attention to this point leads almost invariably to the selection of improper pipe sizes. If sizes larger than necessary are used, not only is the cost increased but the overall efficiency of the system may be considerably reduced by greater heat losses from the increased surface area of the pipe. On the other hand if the pipe is too small, higher velocities than are economical will reduce the efficiency and perhaps handicap operations by restricting the flow.

The effect of fittings on frictional resistance is very pronounced and in most cases a properly designed welding elbow will pay its own cost in a short period. The following example, which represents an extremely simple case, will illustrate the point:

Suppose that water is being pumped through a 3 in. line at a velocity of 6½ ft per second. The loss in head, expressed in inches of water, through a 3 in. welding elbow at this velocity is 1.1 in. while the loss through a single weld miter elbow at the same velocity is 7.6 in. of water. See Fig. 2. This means that a miter elbow in the line causes the pump to operate against a head which is 6.5 in. of water greater than necessary.

Now a 3 in. line in which water is flowing at 6½ ft per sec delivers almost exactly 9,000 gallons of water per hour. The formula for power consumption per 1,000 gallons per hour of water pumped is:

$$\text{Power consumption in kw-hr per 1,000 gal per hr} = \frac{\text{Head in feet} \times .00315}{\text{Pump efficiency} \times \text{motor efficiency}}$$

The equivalent head in feet of the *extra* friction is

$$\frac{6.5 \text{ inches}}{12} = .54 \text{ ft of water.}$$

In this problem we shall assume a pump efficiency of 65% and a motor efficiency of 85%, and since the formula gives the power consumption for 1,000 gallons per hour, we shall first multiply by 9. The formula then reads:

$$\text{Kw-hr} = \frac{.54 \times .00315 \times 9}{.65 \times .85} = .0278 \text{ kw-hr.}$$

If the pump is operated continuously and current costs $0.02 per kw-hr, the cost of a single 90° miter elbow figures $0.0133 per day. This means that the extra cost of pumping through this miter elbow will just about pay for a 3 in. 90° manufactured welding elbow every 200 days! Should the pump operate only 8 hours per day the welding elbow will yield a return of about 60% per year on its cost. When one considers that under ordinary circumstances a piece of equipment that pays for itself in five years justifies its

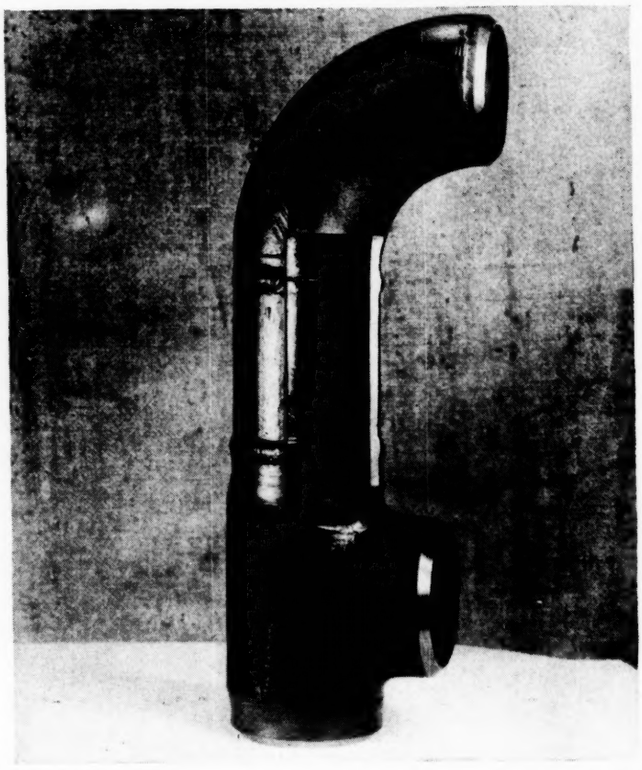


*Fig. 6. The improved construction that results from the use of manufactured welding fittings is well illustrated by this tee, nipple and welding elbow assembly. Note accurately sized ends and machine tool bevels. The mark on the side of the tee is not a weld but a slightly raised ridge formed by the dies.*

purchase, it will be seen that it is certainly false economy to use single weld miter elbows.

The foregoing comparison assumes no cost whatever for the miter weld elbow whereas it will actually cost considerably more to cut the pipe and make the long and comparatively difficult weld than it will to make the two straight-around welds required to install the manufactured fitting. It should also be remembered that while the example covers water being pumped the same considerations hold true for steam and other gases, so that in practically every case the use of miter elbows of this kind is uneconomical.

It is quite true that the loss through a two-weld miter elbow is less and that not all home-made fittings will show such startling results. Few data have been published on the subject, however, and no very definite statements can be made except to remark that it would be difficult to conceive of a fitting fabricated by welding that would compare favorably on this score with manufactured fittings of the same type.

Another consideration, somewhat less important but at the same time worth serious thought, is the appearance of the finished job. The unsightly appearance of miter welded lines is undoubtedly a real drawback and the awkward looking angles really offend the design sense of engineers who, by training and intuition see every structure in the light of the functions it is designed to perform.

Thus far we have considered only piping in which strength, permanence and efficiency of operation are of major importance and this, it must be admitted, covers only a few of the considerations. However, it should be remembered that even when strength is not of great importance, as in low pressure services of many kinds, long life and efficiency should in practically every case be given serious consideration. This is usually true regardless of whether the fluid piped is a liquid or a gas or whether it is being pumped or moved by gravity.

The point is that in the types of jobs we have been thinking about, cost is not given nearly so much weight as it is in the many low pressure, low temperature piping installations. In the building field the question of using welding fittings or fabricating is, of course, usually up to the mechanical engineer and since these men are responsible for the quality and performance of the finished job they usually require the use of manufactured fittings. Some go even farther and outline certain specifications to which the fittings must conform as, for example, the requirement that the elbows have tangents and quarter-marks or be reinforced in the crotch zone.

If there were no question of cost it is unlikely that any use whatever would be made of fabrication by means of welding other, of course, than in those rare instances in which no combination of welding fittings could meet the layout conditions. Hence, the matter boils down almost completely to a balancing of costs against other considerations. And it is indeed unfortunate, from the standpoint of the manufacturers and distributors of welding fittings, that so few reliable cost data are available.

If it were possible to say, for example, with a reasonable degree of certainty, "Now let's see. A six inch standard thickness welding elbow costs so much, installed, and I can make a two-weld miter elbow for so much," then one would really have something concrete to go by. While anyone can learn simply by 'phoning the nearest distributor (if he is one of the rare individuals engaged in piping work who doesn't have welding fittings prices on file) the exact cost of any welding fitting, he can not in many cases tell what it will cost to install it. His guess as to on-the-job fabrication costs is likely to be off by a large percentage.

One of the principal difficulties in figuring the cost of miter welding and intersection welding is that of determining how much extra time will be required to make the welds when the cutting is not quite true. Certainly no one can cut a piece of pipe by hand with the cutting torch and get a result that compares favorably with the machine tool beveled ends of a welding fitting, no matter how carefully the cut was layed out and marked. Frequently additional cutting and trimming are required to make the welding ends match and even under the best conditions there is almost bound to be a certain amount of inaccuracy. This means that extra rod will have to be mitered to fill in the spaces and that extra time will be consumed in manipulating the rod and torch to keep the weld metal from running through the gap where welding ends are too widely spaced.

Perhaps more important, even though less tangible, is the effect of the cutting, trimming, beveling and general *messing around* required in making up fittings by welding, on the smooth, even progress of the job. The welder who can keep on laying down metal hour after hour and thus hit his stride and stay on it, will put together a lot more pipe in a day than the one who has to stop every so often to lay out and make a cut, clean off scale, fit the pieces together, hold them in some manner and finally make his weld. When manufactured fittings are used welders can literally get *in the groove* and stay there—which is very different from getting into a rut.

It is interesting to note that in recent years more and more piping contractors have adopted manufactured fittings and have ceased trying to save money by miter and intersection welding. It is granted that on paper a logical looking case can be presented for the practice but wide experience under field conditions has lead most of the larger contractors to the conclusion that lower over-all costs result from the use of manufactured fittings.

In summing up it may be said that the only argument in favor of on-the-job fabrication is the possibility that the practice results in lower costs and even this argument tends to disappear under close examination of all factors. Many who from wide experience are in the best position to know the facts have reached the conclusion that it is uneconomical not only because of a less satisfactory job but also on the basis of actual direct cost.

It would seem fairly safe to predict that as time goes on miter welding, intersection welding and other substitutions of fabrication for fittings will gradually fade entirely out of the picture and that eventually manufactured welding fittings will be used on all jobs.

# WASHINGTON NEWS

## *summarized by Loring F. Overman. Fernald Heads Air Conditioning Div.; W. W. Timmis Streamlines His Branch; Ickes Explains the Fuel Oil Situation.*

Formation of a Commercial and Industrial Refrigeration and Air Conditioning Branch of the War Production Board, giving these industries major status in the scheme of things at the Nation's capital, was announced March 2.

J. M. Fernald, formerly general manager of the Baker Ice Machine Company, was named as chief of the branch, with Sterling Smith and Roderick Tait as assistants. The organization chart of the new branch has not yet been set up, but is to include sections and personnel to deal with all military and civilian divisions of both commercial and domestic refrigeration and air conditioning.

Until the formation of the new branch, refrigeration and air-conditioning was handled as a section under the Consumers' Durable Goods Branch of WPB. As explained by WPB executives, establishment of the separate branch means that, in the eyes of official Washington, these industries "have grown up, put on their long trousers, and have taken their place alongside other major industries serving the war effort."

New quarters for the branch and the increased personnel are now being sought. Pending completion of the organization work, the present staff will continue its work of representing the industry in matters pertaining to priorities, allocations, conversion, and requirements of Army, Navy and essential civilian classifications.

### Urgent Appeal Issued

While matters pertaining to the new branch have understandably occupied much of the attention of staff members for several days, future considerations were shelved March 2 to permit issuance of an urgent appeal for the immediate return of empty freon cylinders to Kinetic Chemicals, Carney's Point, N. J. A serious shortage of cylinders has developed—one which must be corrected if a curtailment of production is to be avoided.

Representatives of the branch have requested HEATING AND VENTILATING to lend all possible stress to the plea that all empty cylinders be returned to Carney's Point at once. Army and Navy officers have wired all posts and yards urging that the request be complied with immediately.

The appeal offers an opportunity to prove how the WPB branch and members of the industry can work hand in hand for the good of all concerned, it is explained at Washington. Staff members of the branch, it appears, have been successful in securing from WPB priorities executives an allotment of sufficient carbon tetrachloride to produce all of the freon gas required for essential operation during March. But with sufficient raw materials assured, it now develops that there are not sufficient cylinders on hand to transport the freon to those needing it and entitled to receive it.

Since records submitted to WPB do not indicate large stocks of freon in the hands of the industry, it must be assumed that vast quantities of empty cylinders are being held for return to Carney's Point. Unless these cylinders are made available, the staff of the branch will be at a loss to explain to the Priorities Division, when the April allotments are considered, why further curtailment should not be ordered.

One of the purposes of the new branch, it is explained, is to act as a liaison between Industry and the Government forces planning the war. When members of the branch have presented Industry's case, however, Industry must in turn do its part if effective results are to be continued.

In this particular instance, members of the branch have been successful in securing approval of Industry's requests for a favorable allotment of freon. In return, and with future supplies at stake, members of the branch urge that Industry back up its Branch by making available the containers necessary for transportation of the product.

### Gas Heat Curtailed

Curtailment in the consumption of natural and mixed natural and manufactured gas was ordered by the War Production Board February 15 to assure adequate supplies for war production activities. One of increased war production uses of natural gas will be the program to manufacture 400,000 tons of synthetic rubber, the major part of which will be made from butadiene, produced from natural gas.

Part of the WPB's order became effective March 1 and applies to seventeen States "where the need for curtailment is greater" as follows: Alabama (except the area served by the United Gas Pipeline Company), Arkansas (only the area served by the Mississippi River Fuel Company), California, the District of Columbia, Georgia, Illinois, Indiana, Kentucky, Maryland, Michigan, Mississippi (except the area served by the United Gas Pipeline Company), Missouri, New York, Ohio, Pennsylvania, Tennessee, and Virginia and West Virginia. Other parts of the order apply over the entire country but do not become operative until a shortage occurs or becomes imminent in any area.

Present customers are not affected as to present uses, but under the order the customer may not install a gas heating system in his home, store or factory, or convert heating equipment, now using other fuel, to gas.

*The order does not affect companies distributing manufactured gas solely.*

The order prohibits the natural or mixed gas utilities in affected states from delivering gas for heating new homes, stores, factories or other buildings, unless the heating equipment was installed prior to March 1, 1942, or the equipment was specified in the construction contract and the foundation under the main part of the building was completed prior to March 1. This applies to a heating system intended to furnish all of the major part of the heat for a home or building but does not apply to individual room heaters.

These utilities were prohibited from delivering gas for heating equipment that has been converted from some other fuel to gas, unless such conversion was completed within ten days after the issuance of the order.

Any utility or any governmental agency, such as a housing company, affected by this prohibition against new and converted installations, which considers that the available gas supply is adequate for all existing and estimated future war requirements, as well as unrestricted civilian use until April 1, 1944, may apply to the Director of Industry Operations for exemption from this provision.

Exceptions include non-residential consumers where (a) Such new or existing consumer has installed standby facilities sufficient to replace the new or increased delivery during periods of shut-off; or (b) such new or existing consumer cannot reasonably use any fuel other than gas; or (c) approval shall have been granted in advance by the Director of Industry Operations for delivery to such new

or existing consumer. This provision became effective ten days after the issuance of the order.

## Housing Agencies Merged

The long-promised streamlining of the nation's all-out war effort—the goal when Donald Nelson was appointed to head the War Production Board — took another step important to the heating and ventilating industry late in February when President Roosevelt merged 16 Federal housing activities into a single organization, the National Housing Agency.

Subject to confirmation by the Senate, John B. Blandford, Jr., assistant director of the Budget Bureau, was named National Housing Administrator, to take office within 60 days. The merger affects some bureaus as a whole and defense housing or housing construction only of certain other units, as follows: Federal Housing Administration; United States Housing Authority; Defense Homes Corporation; Farm Security Administration defense housing; War Department defense housing; Navy Department defense housing; Federal Works Agency defense housing; Public Buildings Administration defense housing; Mutual Ownership Defense Housing Division; Division of Defense Housing Construction; Central Housing Committee; Federal Home Loan Bank Board; Federal Home Loan Bank System; Federal Savings and Loan Insurance Corporation; United States Housing Corporation; and Home Owners Loan Corporation.

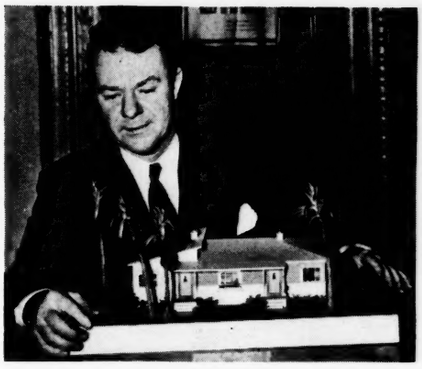
In a second executive order the President abolished the Federal Loan Agency and divided its bureaus between the new NHA and the Commerce Department, which is under Secretary Jesse Jones, who will continue to handle all Federal loans except those for housing.

The President said that a number of housing employes would be released to war jobs by the merger. He admitted that there had been duplication, conflict, disputes, and overlapping among the agencies. He explained the housing agencies just grew up like Topsy, but he said there was good reason to make each agency separate when it was created.

The Division of Defense Housing Construction, which was headed by Charles F. Palmer, and the Central Housing Committee, whose chairman was Lowell Mellett, also are wiped out by the order, along with the jobs of an estimated 350 employes. The President said that he had asked Mr. Palmer and two assistants to tour England for a study of war-time housing.

Three separate divisions are set up under Blandford in the new agency, namely:

1. The Federal Housing Administration.



*John B. Blandford, Jr., head of the newly-created National Housing Agency. Mr. Blandford, 45, is a mechanical engineer, formerly with several city governments, The Texas Co., later coordinator of TVA, then general manager of TVA and, since 1939, assistant director of the Bureau of the Budget.*

2. The Federal Home Loan Bank Administration.

3. Federal Public Housing Authority.

The Federal Housing Administration will include the present functions of FHA. It will be under Abner Ferguson, whose title will be commissioner.

Leon Keyserling was appointed acting commissioner of the Federal Public Housing Authority which will cover present functions of United States Housing Authority, of which Mr. Keyserling has been acting administrator; FRC's Defense Homes Corporation, non-farm public housing from Farm Security Administration, and defense public housing except what is on Army and Navy reservations.

Defense public housing has been divided among the Federal Works Agency, USHA, Public Buildings Administration, Farm Security, War and Navy Departments, Mutual Ownership Defense Housing Division and the Division of Defense Housing.

The Federal Home Loan Bank Administration will be directed by John H. Fahey. It will include the functions of the Federal Home Loan Bank Board, Federal Home Loan Bank System, Federal Savings and Loan Insurance Corporation, Home Owners Loan Corporation, and the United States Housing Corporation which is being liquidated.

Apparently just the defense housing work of Public Buildings Administration will be shifted to NHA. Other construction activities and maintenance work of PBA will seemingly remain in Federal Works. However, the order isn't clear on that point. Federal Works appears to retain control of Defense Public Works which builds schools, hospitals, and other facilities for defense communities.

Federal Works, however, will lose all of USHA and its employes, also the defense housing unit under Rufus Newman.

Transferred to the Commerce Department under the far-flung order are the RFC and all its constituent corporations such as Defense Plant, Rubber Reserve, Disaster Loan and the like, also Electric Home and Farm Authority, RFC Mortgage Co. and the Export-Import Bank of Washington. The transfer will take at least 11,000 of Federal Loan's 17,000 employes.

The order, the President said, will make for swifter and more efficient prosecution of the war. It will improve and simplify administration, he said, but it will not change purposes.

## Blandford Formerly with TVA

Of Mr. Blandford, the housing czar, the President said he has shown an amazing executive ability. Mr. Blandford is 45, has been with the Budget Bureau for two years. He is a former general manager of TVA.

The appropriations of the 16 housing agencies will be dumped into the lap of Budget Director Harold D. Smith, who has been instructed by the President to work with Mr. Blandford in setting up a budget and personnel for NHA. The order, the President said, will not cause a day's delay and he predicted that the production of war housing would be speeded up immediately.

From the standpoint of the heating and ventilating industry it may be anticipated that simplifying of the defense housing program will result in a single standard that will facilitate manufacture and delivery of needed units and perhaps clear the way for construction in some fields of privately financed housing.

## Plumbing-Heating Branch Active

WPB's newly formed Plumbing and Heating Branch, under the direction of W. Walter Timmis, did some simplifying of its own during February and should be in readiness to take full advantage of the revised housing set-up as soon as it becomes fully operative. Numerous meetings in the interest of simplification and conservation of scarce materials were held with industry representatives, and the agreed-upon changes are just beginning to make their appearance.

Simplification of pipe fittings was ordered February 25 in Schedule II to Limitation Order L-42, covering plumbing and heating equipment. The pipe fittings schedule, in its entirety, has already been issued as a simplified practice recommendation by the Department of Commerce. Schedule I, issued February 11, required simplification of iron, brass and bronze valves.

Copies of the limitation order and the supplementary schedules can be secured by writing Plumbing & Heating Branch, War Production Board, Washington, D. C.

## Decorative Fixtures to Disappear

Fancy radiators, concealed piping, and other heating equipment luxuries will probably disappear from trade channels for the duration of the war. At a meeting called late in February by the Branch to discuss simplification of vapor and vacuum specialities, manufacturers agreed to simplify the number of sizes of radiator valves, trap bodies, and other items in order to save productive capacity and critical materials.

The simplification program will probably include the use of cast iron in a number of parts which formerly consumed brass, and elimination of several connecting pieces which allowed for concealed radiation.

Army and Navy purchasing agents will soon specify the simplified equipment, it was indicated at the meeting. Terms of the requirements will be issued as a separate schedule to Limitation Order L-42.

## Brass Goods Affected

Simplification of all types of plumbers' brass goods has also been discussed at an industry meeting with representatives of twelve leading manufacturers, who were told that the shortage of critical materials would not permit the production of a sufficient amount of brass goods to supply both the Government's war needs and ordinary civilian requirements.

War Department and Navy Department representatives have assured the Plumbing and Heating Branch that all future contracts will specify the types of equipment decided upon as an outgrowth of the simplification program. Items included in the program are bathtub fittings, shower stall fittings, lavatory fittings, and water closet, kitchen sink, and laundry tray equipment.

## Staff Appointments Announced

Appointment of George E. Hoffman, Chicago, as special consultant to the Plumbing and Heating Branch and of Ronald Allwork, New York, as chief of a newly created Planning and Projects section within the Branch has been announced.

Mr. Hoffman, a sales division executive of the Crane Company in Chicago, was previously a member of the Plumbing and Heating Industry Advisory Committee.

Mr. Hoffman has been president of the Plumbing and Heating Industries Bureau, and is a past president of several other industry manufacturing associations. In addition to his post with Crane Company, he is a director and vice-president of the Trenton Potteries Company, Trenton, N. J., and vice-president of the Crane Enamelware Company, Chattanooga, Tenn.

The new Planning and Projects section will analyze statistical data affecting the requirements and capacity of the plumbing and heating industry, and maintain close contact on current technical developments with other branch sections and with the industry.

Mr. Allwork is a graduate of the School of Architecture, Columbia University. During the last two years, he has been a specialist in the preparation of specification and installation data for building products and equipment. Previously, he had been connected with the American Radiator and Standard Sanitary Corporation, and with the Red Hook Houses development as a designer.

Lorin W. Smith, Jr., who has headed the fixtures and specialties section of the Branch is now heading a new conservation section studying among other subjects, the possibility of conserving critical materials through the use of repaired units wherever possible.

## Fuel Situation

An important drop in East Coast stocks of crude oil, light and heavy fuel oil, and gasoline — a drop so marked that it may explain why inventory figures are no longer available for publication—has caused Federal Petroleum Coordinator Harold L. Ickes to draft an 8-point program designed to prevent actual shortages for the balance of this season, and to start building the backlog of supplies to be needed in the future.

Recent tanker sinkings have already wiped out surpluses built up during the much-discussed conservation program last Summer, according to Coordinator Ickes. If the current rate of tanker sinkings continues, he reports, only an early Spring will prevent serious shortages inconveniencing both domestic and commercial users of fuel oils. While it is anticipated that with favorable weather Eastern Seaboard oil users will just be able to "squeeze through," conservation programs now in effect must be strictly observed and further economies must be effected to assure adequate stocks next season.

"In brief, as I see the present situation," said Petroleum Coordinator Ickes, "we are confronted with a scarcity of heavy fuel oil, the failure of which supply would seriously interrupt extensive manufacturing plants, particularly in New England. We are in the hands of the weather so far as our stocks of light fuel oil are concerned. We may run into a serious shortage there.

"I think that some light may be thrown on the situation by reviewing the East Coast inventories as prepared both by the Bureau of Mines and the American Petroleum Institute. These figures show that our stocks of the four major petroleum items—crude, heavy oil, light heating oil and gasoline—amounted to 65,886,000 barrels on December 13, 1941. This was 8,400,000 above the same date a year before.

"Ever since then, stocks have been going down, without interruption.

"By January 17, the excess over last year was but 482,000 barrels. Then, suddenly, plus signs turned to minus signs, and by February 7, they had gone down to 5,705,000 barrels below the supplies available on the East Coast a year before.

"Now, I realize that it is normal for East Coast stocks to decline at this time of year as the supplies of fuel oil are tapered off in anticipation of Spring and because of market conditions, but the decline which is now in progress is far more severe than normal.

"The East Coast stock inventory report for the week ending February 7, shows that the supplies of crude oil, gasoline, light heating oil and heavy fuel oil available on the East Coast declined by 2,120,000 barrels during the week. Crude oil fell off during the week 1,067,000 barrels and gasoline went down by 193,000. Light heating oil declined 644,000 barrels; and heavy fuel oil fell off by 216,000 barrels.

"Comparing the inventories today

*(Right) Lorin W. Smith, Jr., who now heads a new conservation section of the Plumbing and Heating Branch, WPB, set up to study the conservation of critical materials through use of repaired units. (Below) W. Walter Timmis, (left), chief of the Plumbing and Heating Branch, WPB, confers with George E. Hoffman newly appointed special consultant to the Plumbing and Heating Branch of WPB. Mr. Hoffman, a sales executive of Crane Company is also vice-president of Trenton Potteries Company.*

with the same week a year ago, all four products are below last year's levels in the face of a greater demand for them. Crude oil is down by 2,693,000 barrels; gasoline by 543,000; light heating oil by 634,000, and heavy fuel oil by 1,835,000 barrels. The total inventories give you the figure I cited a moment ago: 5,705,000 barrels below the level of last year.

"You may recall that, last Summer, something was not only said about the probability of such a situation, but something was done about it—not too little, too late, as so frequently is the case. In fact, some said too much was done too soon, then — but they may have a different opinion, now.

"During last Summer's period of sales' restrictions and curfews, East Coast stocks of crude oil and the three principal products were built up from a deficit of about 9,000,000 barrels, as compared with the year before, to a surplus of 482,000 barrels by the time that the restrictions were lifted. That wasn't much of a cushion, but, thanks to the warmest Fall in the history of the Weather Bureau, it kept growing until it reached a peak on December 13 of 8,400,000 surplus. It's all gone, now.

"I now want to pass along to you a written statement that has come to me from the heads of the principal oil companies in the Eastern area. They came to Washington at my request, and we discussed the East Coast situation fully and frankly. We also took a general view of the national and world situation. I asked these business experts to assemble and analyze all of the facts, as promptly as possible, and report them to me, together with their independent recommendations. This they have done. "Their statement, which I understand was checked by their technical men, was approved by: Wm. S. Farish, president, Standard Oil Company (New Jersey); Stuart Colemen, Standard Oil Company (New Jersey); J. Frank Drake, president, Gulf Oil Corporation; H. F. Sinclair, president, Consolidated Oil Corporation; J. W. Carnes, vice-president, Sinclair Refining Company; W. S. S. Rodgers, president, The Texas Company; R. H. Colley, president, Atlantic Refining Company; R. E. Wilson, president, Pan-American Petroleum & Transport; D. I. Graves, vice-president, Tide Water Associated Oil Co.; F. A. C. Guspin, vice-president, Shell Oil Company; and W. D. Mason, vice-president, Sun Oil Company.

"Here is the report that was presented to me:

" 'The following statements of fact and recommendations regarding the East Coast supply situation and the immediate outlook are agreed upon by the representatives of the Industry here assembled:

" '1. Overall East Coast inventories of petroleum and its products on January 31, 1942, as afforded by the Bureau of Mines (exclusive of stocks and bonds) were 64,550,000 barrels. This represents a decrease of approximately 3,250,000 barrels from stocks on a comparable basis as of the corresponding date the year before. In terms of days supply, stocks as of January 31, 1942, represented an estimated thirty-nine days against forty-three days as of the same date last year at the rate of consumption then prevailing.

" '2. While the overall industry stocks are comfortable, the diversion and sinking of tankers and delays brought about by war conditions, have resulted in the reduction of East Coast stocks by about 11,500,000 barrels during the month of January, or at the average rate of approximately 370,000 barrels per day. This is more than three times the normal rate for this month.

" '3. From past history, daily consumption in February and March averages only slightly less than in January. Therefore, unless some steps are taken to bring about a positive curtailment, we should anticipate that the average daily demand until April 1, 1942, will be practically as great as during the month of January when stocks were pulled down at such an alarming rate.

" '4. Available tanker transportation decreased substantially during the month of January due to sinkings, diversions and new regulations. Only partially offsetting this are substantially increased use of tank cars, the coming into operation of the Plantation pipe line and increased operations of the Southeastern pipe line.

" '5. So far as the overall outlook for transportation facilities between now and April 1 is concerned, while the completion of several tankers is hopefully anticipated, it seems only reasonable to assume that these cannot be expected to offset further diversions already in sight and possible additional sinkings.

*Conversion of plumbing fixtures to non-critical materials was a major subject discussed February 3 by WPB when manufacturers gathered to discuss the situation with this group of government officials: (left to right) Henry W. Vagel, War Department; W. Walter Timmis, chief of the Plumbing and Heating Branch, WPB; Preston H. Barnard, Bureau of Yards and Docks, Navy Department; Vincent Mansa, U. S. Housing Administration, and Ralph Engel, War Dept.*

" '6. With necessary reservations as to the uncertainty of weather conditions, the number of additional diversions and sinkings, and in loss in carrying capacity used in the new regulations, it is the opinion of the assembled industry representatives that unless steps are promptly taken to bring about substantial curtailment, the drop in total East Coast stocks will continue at about the same rate during the next seven weeks as during January, and that this will bring total East Coast stocks substantially below a safe working level.

" 'The industry is using more tank cars to bring crude and products into District No. 1 than at the peak of the movement last Fall, and in addition, has substantially more tank cars on order than it has been able to secure. It is accordingly urged that the railroads be requested to speed up tank car turn-around, and that tank car users in Districts 2 and 3 be asked to make available about ten percent of their cars to be used in this emergency movement.

" 'In addition, the assembled industry representatives recommend that steps be taken to curtail the total East Coast consumption of petroleum products to the extent of approximately 15% from current levels during the period February 15 to April 1. It is impossible at this time to predict whether or not curtailment will be necessary beyond that date when total consumption normally falls off substantially. On the other hand, this period of reduced demand should be used to rebuild stocks to more normal levels by next Fall.' "

Based upon the current situation and recommendations of representatives of the oil industry, the office of the Federal Petroleum Coordinator has taken the following steps:

(1) Effective February 16, made effective a plan for distribution of avail-

*(Continued on page 57)*

# Air Conditioning Goes to War!

By WILLIAM B. HENDERSON†

**Air conditioning is one of the important factors in America's war effort. Yesterday people thought of air conditioning as the acme of luxurious living. Today air conditioning is a front-line fighter in our battle to survive. Uses of air conditioning on the firing line and to back up the firing line are many — too many to permit discussion in a brief survey. However, in this abstract of an address by Mr. Henderson before the Detroit section of the American Society of Refrigerating Engineers, some of the more outstanding wartime uses of air conditioning are reviewed to give an idea of the wide scope and versatility of air conditioning.**

THE United States Navy has been a heavy buyer of air conditioning for many years. Those submarines which are harassing the Japanese supply lines, and taking toll of Jap warships and troop transports, are air conditioned for the health and operating efficiency of the crew. Among other reasons, air conditioning is important to submarine operation because, when a vessel is submerged, particularly in tropical waters or in summer, the temperature may rise to more than 100F and humidity may increase to the dew point so that sweating to cool the body is impossible.

Aboard the Navy's warships, air conditioning in gun turrets removes powder fumes and keeps temperatures at a reasonable level. The purpose is to maintain at a high point of efficiency the split-second team work of the gun crews pumping shells at the enemy. Down in the powder magazines a careful range of relative humidities is maintained to minimize the danger of explosions from static sparks and other causes. Air conditioning lends a hand in the warship's fire control stations, plotting rooms, and other vital points.

The Army, too, is a user of air conditioning right up in the field of action. Our men will be fighting this war in every type of climate—from the dry, brittle cold of the frigid zone to the steaming swamps and the burning sands of the tropics. Air conditioning comes to the fore to make those extremes of weather bearable. Among the Army's items of active service equipment are air conditioned tanks, air conditioned mobile photographic dark rooms, air conditioned mobile laboratories, and air conditioned mobile hospitals.

Obviously an army or a navy is only as good as its lines of communication and supply. Here it is that air conditioning is seen in its most effective role, helping provide our fighting forces with weapons, with food, with clothing—helping to furnish life-restoring medicines and vaccines — helping to provide the optimum conditions under which our wounded may edge their way back to health in hospitals behind the fighting front.

†Executive Vice-President, Air Conditioning and Refrigerating Machinery Association, Inc., Washington, D. C.

Time and time again, this war has proved, conclusively, that an army or a navy deficient in aircraft cannot protect a nation from an invader well equipped with aviation. The aircraft industry relies heavily on air conditioning. For example: It is imperative that humidity and temperature conditions in aircraft plants be kept under control because changes in temperature may make tolerances vary as much as 200% to 300%. This is a critical matter where tolerances for engine parts must be as fine as 3/100,000 of an inch. Highly-finished and accurately-machined metal parts rust rapidly when humidity is excessive. Unless air conditioning is called upon to filter the air before it is drawn into the airplane plant, dirt and dust from unfiltered air damage metal parts, machined to hairbreadth accuracy.

There is the job air conditioning is called upon to do in the aircraft testing laboratories; there is the indispensable place air conditioning fills in the manufacture of delicate airplane instruments—but those are "two other stories," to be told later.

Not the least important of air conditioning's contributions to "keep 'em flying" is its effect on the airplane workers themselves. The vast airplane factories all over the country work "around the clock," three eight-hour shifts seven days a week. Most of the plants are "blacked out." The health and morale of the workers must be safeguarded so that the long assembly lines may not slow down. In midsummer heat and biting winter cold, whether there is rain or sleet or snow or a dust-laden summer windstorm outside the factory, air conditioning brings to those ever-busy airplane workers fresh, clean air, tempered to induce better physical health and mental keenness, offsetting the strain of long hours of exacting labor.

"Steel, and more steel" is a constant cry, though the steel industry is already working practically to capacity. It would take eighteen months to two years to build extra furnaces, to expand steel-producing capacity 12% to 15%. The building of new furnaces would consume a substantial amount of materials urgently needed elsewhere. But again air conditioning comes to the rescue. Air conditioned blast furnaces increase pig-iron output by as much as 20%, with a 13% saving in coke per ton of iron. To equip existing blast furnaces with air conditioning will require only five or six months and consume only a negligible amount of critical materials.

Speaking of finished steel leads naturally to mention of the prominent role air conditioning plays in the mining of ore, and particularly copper. One example is the well-known Magma Copper Mine out in Arizona. Ordinarily this productive mine would have had to be abandoned, because at its 4600-foot depth the temperature ran as high as 150F—but air conditioning brought that temperature down to 90F and the mine

continues to furnish our war machine with large quantities of copper.

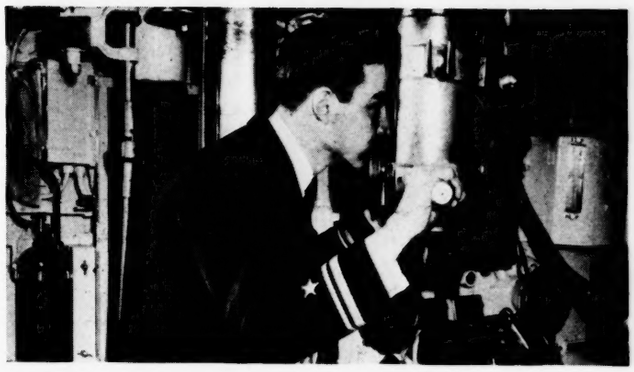
Industrial diamonds are essential to our tremendous war materials output. Expansion of production has been slow because there are only about 500 diamond cutters in the country, with no probability of an early increase in the supply of that highly-skilled labor. Another major obstacle to speeding up industrial diamond output has been humidity. A diamond saw won't work in wet, muggy weather. Even the slightest excess humidity slows up the process of sawing the precious stones. In one of the large diamond-cutting plants in New York City, a hundred expert diamond-cutters are employed. In that plant, an air conditioning unit in the sawing room maintains a definite humidity and temperature condition which diamond-cutters agree is ideal for their work. The cutters can keep their saws running continuously, and the result has been to increase the sawing capacity by 30%.

In the production of cameras and photographic film, in the manufacture of range finders, telescopes, bomb sights, chronometers, and other delicate equipment essential to the operations of the Army and Navy, air conditioning is as indispensable as the highly-skilled workmen. The delicate machining and adjustments, the scrupulous cleanliness of the components, can be obtained only if temperature and humidity are closely controlled and the amount of air-borne dirt minimized.

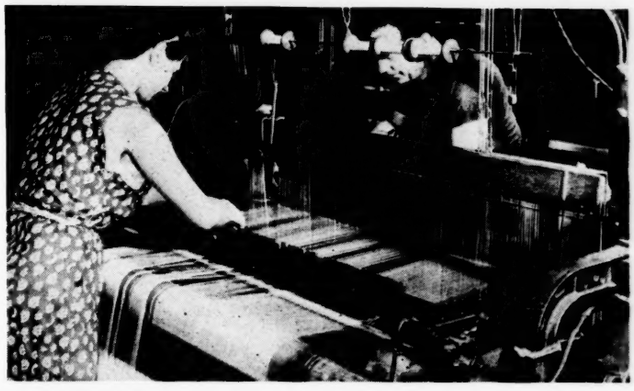
In the testing and research laboratories, air conditioning plays one of its most important parts. Military equipment is rigorously tested under simulated weather conditions of all kinds. There is close observation of the reaction of metals, of lubricants, of plastics, and of completed weapons—in temperatures ranging from —100F to 150F, in wind velocities exceeding 100 miles an hour, in relative humidities approaching the dew point—and provision is made to eliminate failure of materials and equipment under extraordinary operating conditions. Thus when our men meet the enemy, no matter in what quarter of the globe he may be found, these fighting tools will function smoothly and effectively, even under the most trying conditions. That such rigid testing is imperative has been demonstrated in this winter's warfare on the Russo-German front. Apparently the Germans had made no preparation for operating large aggregations of their war equipment in temperatures as low as —40 and —50F. The result is that the line of German retreat is marked with huge amounts of abandoned material which broke down under the severe operating conditions. Comparatively small difficulty appears to have been encountered by the Russians, who had had experience operating mechanical equipment in sub-zero weather.

Air conditioning is needed in the laboratory, not only to test actual fighting gear, but also to test other indispensable military materials, such as concrete, paints, explosives, chemicals, medicines and drugs, motor fuel and lubricants. Thus our military leaders may guard against disastrous supply deficiencies such as the Germans are now experiencing in Russia.

Air conditioning is essential in the manufacture and loading of high explosive shells, such as depth bombs, projectiles, and mines. It is needed in the fabrication



**SUBMARINES** Air conditioning is important because the temperature may rise to 100F. . . .



**UNIFORMS** Air conditioning is practically indispensable in the weaving of woolen and cotton fabrics. . . .

**TANKS** Among the Army's items of active service equipment are air conditioned tanks, mobile hospitals and laboratories. . . .

**WARSHIPS** Air conditioning in gun turrets removes powder fumes and keeps turret temperatures at a reasonable level. . . .

**STEEL** Air conditioned blast furnaces increase pig-iron output by 20% with 13% saving in coke. . . .

**PLANES** Air conditioning prevents rust and dirt from damaging high-precision engine parts. . . .

and loading of fuses for high explosive shells. It helps produce not only black and smokeless powder but also other high explosive chemical mixtures.

In the weaving of woolen and cotton fabrics for military clothing, in the manufacture of synthetic textiles such as rayon and nylon, air conditioning is practically indispensable.

Air conditioning speeds along the mass production of telephone and radio equipment, bullet-proof glass, machine tools, food products, ball bearings, plastics, pharmaceuticals and drugs, and many other necessary military supplies.

Only a few of the wartime uses of air conditioning have been mentioned. Many interesting ones could be added, such as the manufacture and storage of parachutes, the packing and storage of serums and vaccines, the storage of bombs and explosives, and the manufacture of synthetic rubber. Yes, history may well class industrial air conditioning among the important "weapons" with which America beat the totalitarian aggressors.

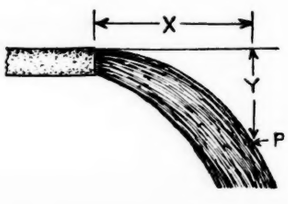
Air conditioning is almost exclusively a product of American inventive genius and skill in development and applications. No other nation has used it to any appreciable degree for improving the quality and increasing the quantity of industrial production. Thus industrial air conditioning should prove to be a decisive factor in helping America win the arms production race over her enemies.

In 1942 we will send against the Nazis and the Japs 60,000 more planes, 45,000 more tanks, 20,000 more anti-aircraft guns, and equally stupendous amounts of hundreds of other kinds of military equipment. In 1943 production of war supplies will be increased to almost astronomical proportions. As these vast quantities of fighting tools, of clothing, of food, of medicines, and of other materials go forth with our men to the far corners of the earth, our industry may take quiet pride in the knowledge that air conditioning is proving itself a vital part of the arsenal of democracy.

## Measuring Water Flow from Pipe

The quantity of water or any other liquid flowing from a horizontal pipe, as shown in the accompanying sketch, can be computed with surprising accuracy by simply measuring the horizontal distance X and the vertical distance Y to any convenient point P as indicated by the dimension lines.

RULE: Measure the internal diameter of the pipe in inches, and square it. Thus, if the internal diameter is 2 inches, square 2 and obtain 4. Then multiply by the distance X in inches. Thus if the distance X is 20 inches, the result is 4 × 20 or 80. Then multiply by 2.56. This gives 80 × 2.56 or 204.8. Lastly, divide that by the square root of the distance Y. Thus if the distance Y is 25 inches, the square root of 25 is 5. Dividing 204.8 by 5 gives 40.96 gallons per minute, the answer.




Note that all measurements are in inches and not in feet, and the answer is in gallons per minute.

A short cut that will make the work easy is to choose a point P that is down a distance 9 inches, 16 inches, 25 inches, or 36 inches, etc., because their square roots are exactly 3, 4, 5 and 6 respectively. In that way it will not be necessary to refer to tables of square roots.

To convert the answer into cubic feet per minute, divide the answer in gpm by 7.5.—*W. F. Schaphorst.*

# NEWS OF THE MONTH

## New England Engineers Discuss Insulation, Night Set-Back, in Considering Fuel Conservation During Emergency

CAMBRIDGE, MASS. — Plant engineers have been urged to insulate all steam pipe lines to save 12% to 20% of lost heat and homes and stoves should have their thermostats set back at night in order to combat the fuel oil and coal shortage which is reaching serious proportions in New England. These points were raised at a meeting on fuel conservation, sponsored by the Engineering Society of New England, and including the Massachusetts chapter of the ASHVE and the Boston section of the NDHA, February 16. There were four speakers.

First speaker was Richard L. Bowditch, chairman of the solid fuels committee of the New England Council. He told the 150 or more engineers present that in 1940 New England imported seventeen million tons of coal, mostly bituminous, of which 12,200,000 tons were brought by water in 42 colliers. In 1941 three million tons more were imported, but consumption was increased. Fleet capacity was cut about 40% after Pearl Harbor by Navy restrictions over navigation. He predicted that there would also be a coal car shortage and that the coal industry would have to take over some of the oil trade, or rather substitute solid fuel for oil, due to danger of submarines, sinkings of tankers and general conditions along the Atlantic seaboard, coupled with the probable shifting of some tankers to the Pacific.

Due to the conditions that slow up the colliers, coal piles up at shipping points and the mines are also slowed up, having no place to which they can ship coal for storage. He advised his hearers and the public to get coal that will serve, and in any way possible, to take deliveries promptly, and to turn the cars back fast, so that they can make more trips, and to work overtime to do this if necessary.

He was followed by J. C. Richdale, vice-president of Colonial Beacon Oil Company, who also has a tale of troubles overcome and more in the offing. New England, in the winter months, consumes 11,400,000 barrels of petroleum products per month. In summer, after April 1, this drops to about 7,400,000 barrels monthly. But now, with the worst two months of the winter to go, the petroleum industry of New England is in trouble again. A dozen tankers have been lost by submarine sinkings and this has cut enormously into petroleum deliveries to New England.

After briefly reviewing the conditions existing last spring and summer in the motor fuel industry, the speaker's comments reverted to fuel oils and the conditions then existing. It was some struggle to fill fuel oil storage, but, he said: "After we got our own and England's storages filled, I became quite an optimist. I couldn't see how we could run into any trouble between January and April, with plenty of oil in storage and transportation moving along serenely.

"But the loss of twelve of our tankers, with a lot of fine sailor boys, the whole system slowed up to such an extent that our inventories have run to a dangerously low level — probably the lowest we have ever known. It now seems as though, unless the industry performs super-human tricks, essential industries must be closed down and homes rationed so low on heating oil that we may look upon a friend who has a fireplace as a swell fellow to spend the evening with.

"We have practically given up using tank cars to move oil around New England, for every available tank car is required to bring finished products here or crude oil to East Coast refineries.

"My first suggestion is that the petroleum industry pool inventories to the extent that we swap products with each other, where one company has a product and the other hasn't. This will save an endless amount of transportation and we have neither rubber nor tank cars to move products to and fro. There isn't time now to set up a complicated compulsory form of rationing and get it working, so that the next best thing is an all-out conservation plan, in which all units of the petroleum industry devote their advertising time and space to telling the public in simple language how they can save enough oil to get us all through this emergency, without any real discomfort to themselves.

"I hardly need tell you fellows how much oil can be saved by turning the thermostat down ten degrees when the family goes to bed; closing bedroom doors when windows are open; turning the thermostat down when you are going out for an extended period; closing off rooms that are not in daily use, and so on."

Joseph A. Sheehan, plant engineer for Bird & Sons, Phillipsdale, R. I., declared that more heat is lost in transmission and distribution through uninsulated pipe lines and through air binding of valves than any other two causes. Eighty-five per cent of the total heat entering a turbine must leave it, and should be utilized as boiler feed. He urged his hearers to take every advantage of insulation, which would effect savings of 12% to 20%. Plant engineers should make diagrammatic studies of their plants and plot where the Btu's go. There should be periodic checks of $CO_2$ and it might be possible to shut down one boiler, increasing the rating of the others in the battery. Plants should all have a good, reliable system of boiler feed water treatment. The engineer should go out through the plant and check on the lights, zones and thermostats. Motors could be arranged and a general rearrangement of power, with the use of capacitors would be very helpful in conserving fuel and keeping down costs.

Carl M. F. Peterson, buildings and power engineer, Massachusetts Institute of Technology, spoke mainly on domestic consumption, although the plant he supervises is far from being a domestic plant. He declared that burners, whether for solid fuels or oil should be adjusted to burn efficiently before going down on the thermostat. Boilers and burners should be cleaned more frequently, both internally and externally.

On the heels of this meeting came the announcement the next day by Clyde G. Morrill, executive director of the Independent Oil Men's Association of Boston that factories and households would be allowed oil only when their tanks were down to 20% of capacity and then would be given only enough to fill their tanks to 75% of capacity. Thus only 150 gallons may be bought by a householder at a time, his tank usually being of 275 gallons capacity. Mr. Richdale, at a conference of the Committee on Public Safety, said that from the Canadian border to the Potomac river the East would be short 15,000,000 barrels of oil between Feb. 17 and April 1, which amount must be saved by restricting its consumption, with the New England situation the most acute. It was added that bituminous coal stocks were fast getting to the dangerously low point, although anthracite stocks are in good shape.

## Incendiary Bombs Discussed

LOS ANGELES — Incendiary Bombs and their Control was discussed at the February 4 meeting of the Southern California chapter, ASHVE. Speakers representing the safety division of the Los Angeles Fire Department outlined measures which the public can invoke to protect their homes and business property against spread of fire from incendiary bombs.

## 192,447 Stokers Sold in 1941, Increase of 25.9% Over 1940; Stoker Manufacturers Pushing Conversion to War Work

CHICAGO—With the most successful sales year in history behind it, the stoker industry is pushing conversion of factories to a war work. While there are a few exceptions, the great majority of the members of the Stoker Manufacturers Association are now operating on a 50 to 95% war basis.

The result is that output of stokers for civilian use this year will probably fall to somewhere between 40 and 50% of the all-time factory sales peak of 192,447 mechanical coal-burning units established in 1941. The total, which covers association members only, compared with 152,825 turned out in 1940. The 50% ratio is the one most frequently forecast by the optimistic, while the conservatives in the industry believe the actual ratio this year will be nearer 40%.

Outstanding as reasons for anticipating a sharp decline are priorities and the rising volume of war work which has already pushed household stoker production into small sections of many of the factories.

The industry as a whole has likewise been unable to share in much of the defense housing program and its materials priorities set-up. A few stokers have gone in here and there on larger, centrally heated projects, but for the most part price limits and specifications virtually force the use of hand-fired warm-air furnaces or individual room units in these inexpensive dwellings.

The same holds true in Army cantonment work where hand firing of barracks boilers is the rule and may be expected to continue because of the abundance of manpower available.

While the outlook is thus none too good for household stoker output, the contrary is the case with the bigger units designed for industrial use. Mechanical stokers sold to companies engaged on war contracts are accorded the proper priority ratings on vital materials and are expected to make a better showing than in 1941 because of the nation-wide construction program now in progress.

The breakdown of 1941 sales prepared by the Stoker Manufacturers Association shows that 91.3% of the units, or 175,844 machines, were for residential and small commercial uses. This compared with a 1940 ratio of 89%. The conclusion is that the volume field for stoker sales is still in housing and most of the companies are quietly entering on a period of extended research and development. No new models will be brought out while the war is in progress, but improvements in design may prove somewhat startling, once the Axis is disposed of.

Detailed comparisons of the number of units sold in 1941 and 1940 by size follow:

| CLASS AND SIZE | 1941 | 1940 |
|---|---|---|
| Residential: | | |
| Bituminous ..... | 158,734 | 123,167 |
| Anthracite ..... | 17,110 | 12,837 |
| Total Residential .... | 175,844 | 136,004 |
| 61 to 100 lbs: | | |
| Bituminous ..... | 6,513 | 7,784 |
| Anthracite ..... | 599 | 970 |
| Total ..... | 7,112 | 8,754 |
| 101 to 300 lbs ..... | 5,810 | 5,249 |
| 301 to 1200 lbs ..... | 2,422 | 1,880 |
| Over 1200 lbs ..... | 1,259 | 938 |
| Total all types ..... | 192,447 | 152,825 |

## 14% Increase in Power Used for Defense Plant A.C.

ST. LOUIS — Increasing demand for electricity needed to operate air conditioning systems in defense plants is indicated in figures released Feb. 19 by the Union Electric Co. of Missouri.

As of Dec. 31, 1941, this utility said, 42,156 kilowatts of connected load for air conditioning was on the lines of their system, which serves one of the nation's major defense manufacturing areas.

This represented an increase of 14% over the load a year earlier, which in turn was 15% above the load on Dec. 31, 1939.

Although the Union Electric system's power pool serves air conditioning systems installed in homes and in commercial establishments it is assumed that most of the 1941 increase in load represents the installation of air cooling systems in defense plants.

Installations of the residential and commercial type have been suspended but defense plants may obtain the necessary equipment because they are classified as essential and in many cases require air cooling to promote workers' efficiency.

During 1941 more than $800 million of primary war contracts were placed with plants in the St. Louis industrial area. Since the end of the year the total has been increased to about $1 billion.

Indicative of the expansion of defense plants in this area is the case of an aircraft factory whose capacity has been increased more than eight times since it was originally constructed less than eight months ago.

The area also contains the country's largest small-arms factory and two large shoe plants. The latter are working on orders to produce during this year 8,000,000 pairs of shoes for the army.

## Westinghouse Drops Heating

PHILADELPHIA—OBI directors met in regular quarterly session at the Benjamin Franklin Hotel here January 27. The morning meeting was addressed by John Schulz, OPA representative, who presented for consideration by the industry the case for development of lighter weight oil burner models in the interest of metals conservation.

The resignation of Westinghouse Electric & Manufacturing Company was accepted because of withdrawal from the home heating business. Other resignations accepted were Reif-Rexoil, Inc., and Quiet-Heet Manufacturing Company.

## Underground Ventilated Plants Used by British Manufacturers

LONDON—Deep under ground, deeper than German bombs ever blasted her island rock, Britain is building war planes.

In what were abandoned mines and quarries a short time ago, ventilated factories equipped with American-made machinery and tools are turning out the vital parts of fighters and bombers.

The invisible bomb-proof industry is operating on an expanding scale. A few of these secret plants already are in production, others under construction. The Ministry of Aircraft Production warily describes the total as "several," but says "thousands" of skilled men and women are employed.

Until recently the transformation of these chill, dark tunnels into models of industrial architecture has been a closely guarded secret.

Trade union officials who came in doubt remained to praise the last word in installations and were sworn to secrecy. So were the few correspondents allowed to inspect one of the smaller production centers in operation and the dusty caverns of another being rushed to completion. The larger site is a project of formidable dimensions and is requiring some 9,000 laborers to convert it. When it is finished the underground workshops will occupy an area roughly three-quarters of a mile square. To ventilate the tens of thousands of square feet of floor space, 3,000,000 cubic feet of fresh air are forced into the workings every minute. The surface air vents are 22 ft in diameter.

The factory workers, whose number can be given only as "many thousands," go to work on four fifty-passenger elevators and two escalators. Ninety feet down they will step into a pleasant blending of coziness and safety.

The mine tunnels are already buttressed with steel and concrete.

## Committee to Draft Foundry Code

CHICAGO—Recently the Government requested the foundry industry to draft a set of rules and recommendations to be used as a guide in providing safeguards for foundries during war time so that maximum operating capacity will not be endangered. In answer to this request, the American Foundrymen's Association has formed a committee to draft such a code of rules for protection of foundries and properties in war time. The committee will function under the safety and hygiene section of the American Foundrymen's Association and will be under the chairmanship of James R. Allan, International Harvester Co., Chicago, chairman of the A.F.A. Industrial Hygiene Codes Committee. This committee has had extensive experience in the preparation of foundry industry codes, having already produced five codes of recommended good practice.

Mr. Allan's experience as chairman of the committee which developed these codes, particularly fits him to act as chairman of the new committee. Committee personnel will be chosen from those individuals who know the requirements of the different branches of the industry and the code will be reviewed before publication by a group of individuals with special experience in individual phases of protection for foundries.

## Wasted Fuel = 84 Destroyers

BUFFALO—Eighty-four destroyers or a thousand Flying Fortresses could be bought with the money lost each year because of improper space-heating operations throughout the nation, William L. McGrath, air conditioning control engineer of the Minneapolis-Honeywell Regulator Company, declared in a talk to three hundred Buffalo industrial superintendents and maintenance engineers, guests of the Air Conditioning Council of Western New York, at Buffalo Turner Hall.

Mr. McGrath, speaking on the care and maintenance of control instruments during wartime, estimated that 25 to 30% of fuel wasted each year in space-heating operations could be saved through the use of proper control equipment.

In addition to the financial savings and physical comforts involved in careful operation of control devices in normal times, the speaker stressed the importance of their instantaneous operation under emergency conditions. An invitation to attend, free of charge, all or part of a fourteen-week course of instruction covering instrument and control devices was proffered by Richard C. Kennan, general service manager of the Brown Instrument Company of Philadelphia, to all present.

## WPA to Study Weather Data

WASHINGTON—More effective allocation of funds to establish heating requirements in military posts is the objective of a project to be started immediately by the WPA, it was announced February 21 by Major Irving V. A. Huie, New York WPA Administrator.

The project will make use of a large number of WPA "white collar" workers who have not been absorbed by the war boom. The Army Quartermaster Corps requested the project for which the U. S. Weather Bureau is sponsor.

The project envisages the computation of standard heating requirements at the military reservations through a forty-three study of Weather Bureau records at 600 observation stations. Mean temperatures and variations from the mean will be studied as a basis for computation.

## Paige Heads Boston A.C. Bureau

BOSTON—Officers for 1942 were elected by the Air Conditioning Bureau at the January 22 meeting as follows: president, Forrest V. Paige, Boston Edison Company, formerly vice president; vice president, L. S. Davis, York Ice Machinery Corp.; treasurer, Daniel Ricker, Boston Edison Company; secretary, Earl G. Carrier, Carrier Corporation; directors, J. M. Means and R. K. del Etoile.

Philip Kirby, engineer of the Westinghouse Electric & Mfg. Co., Boston, was the guest speaker, on the "New Sterilamp and Its Use in Air Conditioning Systems."

## 869 A.C. Systems for N.Y. in '41

NEW YORK — According to a report of the Consolidated Edison Company of New York, Inc., 869 air conditioning installations, totaling 9816 hp, were connected to that company's lines during 1941. The accompanying table shows these figures broken down by borough and type of installation.

## A.C. Railroad Cars Up 587

WASHINGTON—Further increase in the installation of air-conditioning equipment in railroad passenger cars is revealed by the Association of American Railroads, which announced Feb. 6 that Class I railroads and the Pullman Co. had 12,787 air-conditioned passenger cars in operation on Jan. 1.

This was an increase of 587 compared with the number of air-conditioned passenger cars a year earlier, when there were 12,200 passenger cars so equipped.

Of the total number of such cars, Class I railroads on Jan. 1, 1942, had 7,523, an increase of 562 compared with the same date last year. The Pullman Co. this year had 5,264 air-conditioned passenger cars in operation, or an increase of 25 compared with Jan. 1, 1941.

## Offner Heads Guide Committee

NEW YORK — Alfred J. Offner, consulting engineer of New York, has been appointed to serve as chairman of the ASHVE *Guide* publication committee during 1942.

The other members of the committee are: Paul D. Close, technical secretary, Insulation Board Institute, Chicago; S. Konzo, research associate professor, University of Illinois, Urbana, Ill.; Charles S. Leopold, consulting engineer, Philadelphia, Pa.; and G. L. Tuve, professor of heat power engineering, Case School of Applied Science, Cleveland, Ohio.

## Return Ammonia Cylinders!

NEW YORK—Unless ammonia cylinders are kept in constant circulation, many users of ammonia for refrigerating food and for other vital purposes may have difficulty in obtaining adequate supplies, according to R. J. Quinn, of the Mathieson Alkali Works, Inc., makers of anhydrous ammonia.

In spite of having to make heavier shipments than ever before, producers can get no new cylinders.

### AIR CONDITIONING INSTALLATIONS IN NEW YORK CITY, 1941*

*(From data supplied by Consolidated Edison Co. of New York, Inc.)*

| TYPE | MANHATTAN | | BRONX | | BROOKLYN | | QUEENS | |
|---|---|---|---|---|---|---|---|---|
| | No. | HP. | No. | HP. | No. | HP. | No. | HP. |
| Residential[1] | 112 | 200 | 4 | 4 | 33 | 36 | 20 | 13 |
| Institutional[2] | 3 | 6 | 0 | 0 | 1 | 1 | 0 | 0 |
| Commercial | 469 | 6013 | 36 | 1159 | 105 | 956 | 46 | 228 |
| Industrial | 24 | 244 | 0 | 0 | 11 | 132 | 5 | 824 |
| TOTAL | 608 | 6463 | 40 | 1163 | 150 | 1125 | 71 | 1065 |

[1]Includes apartments and hotels [2]Such as hospitals *Hp to nearest whole number

## Herder, Leach Join Coal Research

COLUMBUS—The addition of two midwestern fuel engineers, Howard A. Herder of the Sahara Coal Company, Chicago, and Vernon G. Leach of the Peabody Coal Company, Chicago, to its technical advisory board has been announced by Bituminous Coal Research, Inc. Mr. Leach is also serving on the Board's Technical Executive Committee. The Board and its Executive Committee guide the research program sponsored by Bituminous Coal Research for the coal industry at Battelle Memorial Institute, Columbus, and are in frequent and close contact with the activities of the laboratory.

As members of the Technical Advisory Board, Messrs. Leach and Herder will give the national program the benefit of their years of experience in adapting bituminous coals to combustion equipment and facilities in both industrial and domestic heating.

## Heating Men on NAM Board

NEW YORK—Executives of the heating, air conditioning and related industries are prominently represented among members of the 1942 board of directors of the National Association of Manufacturers.

Included are: T. H. Banfield, president, Iron Fireman Manufacturing Co.; F. N. Bard, president, Barco Manufacturing Co.; H. C. Beaver, president, Worthington Pump and Machinery Corp.; Donaldson Brown, vice chairman, General Motors Corp.; Howard Coonley, chairman of the board, Walworth Co., Inc.; C. S. Davis, president, Borg-Warner Corp.; Lammot du Pont, E. I. du Pont de Nemours & Co.; H. W. Prentis Jr., president, Armstrong Cork Co., and Charles E. Wilson, president, General Electric Co.

William P. Witherow, president of the Blaw-Knox Co., is president of the association.

## '41 Unit Heater Sales Up 78%

WASHINGTON—According to the Bureau of the Census, U. S. Department of Commerce, unit heaters valued at $21,840,920 were sold in 1941 as compared with $12,290,383 in 1940. Other equipment sales as reported by the Bureau totalled as follows:

| | 1941 | 1940 |
|---|---|---|
| Ventilating blowers | $1,888,787 | $1,466,182 |
| Blower filter units | 2,211,115 | 2,974,473 |
| Small housed blowers | 1,917,308 | 980,058 |
| Domestic forced draft blowers | 189,600 | 121,865 |
| Light duty axial fans | 7,197,726 | 4,763,232 |
| Heavy duty axial fans | 1,356,636 | 513,222 |
| Unit ventilators | 939,493 | 858,504 |
| Indirect heating surface | 4,395,386 | 3,047,515 |
| Air washers | 570,823 | 376,704 |
| Industrial humidifiers | 1,124,099 | 839,042 |
| Comfort humidifiers | 224,528 | 393,245 |

| TYPE OF FURNACE | TOTAL (YEAR) 1941 NUMBER OF UNITS | 1941 VALUE | 1940 VALUE |
|---|---|---|---|
| Warm-air furnaces and complete winter air conditioning units | 517,610 | $55,394,298 | $40,892,606 |
| Complete winter air-conditioning units | 168,199 | 27,104,688 | 16,202,091 |
| Cast-iron furnace: | | | |
| Coal-fired | 8,716 | 1,110,236 | 2,592,262 |
| Gas-fired | 32,263 | 5,117,674 | 2,906,735 |
| Oil-fired | 3,085 | 1,462,211 | 1,519,964 |
| Steel-furnace: | | | |
| Coal-fired | 25,443 | 4,234,391 | 1,767,233 |
| Gas-fired | 51,668 | 7,221,117 | 3,131,089 |
| Oil-fired | 47,024 | 7,959,059 | 4,284,808 |
| Warm-air furnaces (gravity type), total | 349,411 | 28,289,610 | 24,690,515 |
| Cast-iron: | | | |
| Coal-fired | 185,777 | 17,021,595 | 16,971,039 |
| Gas-fired | 17,085 | 1,085,926 | 903,204 |
| Oil-fired | 3,056 | 716,973 | 677,853 |
| Steel: | | | |
| Coal-fired | 76,210 | 5,802,166 | 4,552,770 |
| Gas-fired | 54,186 | 3,009,451 | 1,342,618 |
| Oil-fired | 13,097 | 653,499 | 243,031 |

## Stoves for Russian War Relief

NEW YORK—Three thousand field-type kerosene stoves urgently requested by Russian authorities for use in front line hospital tents and in refugee colonies along the ice-bound Russian front were included in a new shipment of 99 cases of relief supplies which left an Atlantic port in February.

The shipment is the sixth sent by Russian War Relief and is the second to leave America this month. A seventh consignment, the largest yet assembled, was expected to leave on a ship a week later.

Stoves sent in the sixth shipment were a pressure type, chosen for adaptability as heating elements for hospital work and for a variety of emergency uses among civilian groups in the re-occupied regions.

## Urged to Build Coal Reserves

WASHINGTON—Large users of coal and coke, especially utilities and industrial users, were urged by the Division of Industry Operations on February 13 to build up their inventories as much as possible to avoid the danger of having to suspend operations in case of an emergency.

## Furnace Business Up 35.5%

WASHINGTON — Warm-air furnaces numbering 517,610 with a value of $55,394,298 were sold in 1941 as compared with an unreported number of units valued at $40,892,606 in 1940. This total was made up as shown above.

## Fleisher Talks at Princeton

NEW YORK—W. L. Fleisher, consulting engineer, was chosen to deliver the first Brackett Lecture at Princeton University, February 17. His subject was Air in Air Raid Shelters.

Mr. Fleisher is a member of the advisory council of the Department of Mechanical Engineering of Princeton, was president of the ASHVE in 1941, and previously served as chairman of the Society's Committee on Research and Guide Publication Committee.

On March 6 Mr. Fleisher will address the Greater New York Safety Council in New York on the Control of Abnormal Temperature and Humidity in Industry.

## Need for Fuel Technologists

STATE COLLEGE, PA.—Industry is greatly in need of more fuel technologists, according to Dr. A. W. Gauger, director of mineral industries research and head of the department of fuel technology at The Pennsylvania State College.

Pointing out that the fuel technology curriculum at Penn State is the only general program of its type offered in the United States, Doctor Gauger said that at no time in the past nine years have there been enough graduates to fill requests from firms seeking to employ them.

## McIntosh Heads ASHVE Research

NEW YORK — At the 48th annual meeting of the ASHVE President E. O. Eastwood announced the appointment of F. C. McIntosh, Pittsburgh, to serve as chairman, and Dr. C.-E. A. Winslow, New Haven, Conn., as vice-chairman of the committee on research for 1942.

Four new members were elected to serve as members of the Committee for three-year terms, as follows: Carl F. Boester, director of housing research, Purdue Research Foundation, Lafayette, Ind.; Dr. John A. Goff, Dean, Towne Scientific School, University of Pennsylvania, Philadelphia; Walter E. Heibel, district manager, Aerofin Corp., New York, and Clyde A. McKeeman, associate professor of mechanical engineering, Case School of Applied Science, Cleveland.

Mr. McIntosh, the new chairman, holds an engineering degree from the University of Wisconsin in 1913. After holding positions with the Pennsylvania Railroad Company and the Universal Portland Cement Company in Chicago, he became affiliated in 1917 with the Johnson Service Company. He was in the Army two years, nearly a year of which was spent in France, and returned to the Johnson Service Company as manager of their Pittsburgh office, a position he now holds.

## NAFM Elects Birkenstock

DETROIT—At the annual meeting of the National Association of Fan Manufacturers held here February 12, the following officers were elected for the ensuing year: J. M. Birkenstock, president; Edgar F. Wendt, vice-president; and L. O. Monroe, secretary-treasurer.

## WASHINGTON NEWS

*(Concluded from page 49)*

able supplies in Eastern States; (2) Recommended that the transportation committee for the area present a plan to allocate tanker tonnage to assure maximum distribution; and (3) Recommended that the transportation committee for the area consider conversion of gasoline tankers to transportation of fuel oils.

The following are under consideration:

(1) Industry recommendation that gasoline stations be closed from 7 p.m. to 7 a.m., and all day Sundays; (2) Industry recommendation that voluntary curtailment of 15% be sought or that plans be made for rationing; (3) Plan to induce manufacturing plants now using oil to convert, wherever possible, to coal; (4) Plan for greater utilization of rail transportation; (5) For reconsideration by War Production Board, plan for construction of 24-inch pipe line from Texas to New York.

The plan for distribution of available supplies, effective immediately and until further notice, provides as follows:

For commercial uses: (A) No marketer shall sell or deliver to any consumer at any single place of business in district one any fuel oil to be used for any purpose other than for domestic heating, if the consumer's stock of fuel oil at such place of business is in excess of the amount that the consumer would normally use at such place of business during the ensuing 14 days; (B) When the stock of fuel oil at a consumer's place of business is only equal to or less than the amount of fuel oil which the consumer would normally use at such place of business during the ensuing 14 days, then any marketer may sell or deliver to such consumer at such place of business an additional amount of fuel oil, provided that the additional amount delivered shall not exceed the full capacity of a single unit of the means of transportation theretofore normally used in making deliveries to such consumer (i.e., tank truck, transport truck, tank car, barge, et cetera) or an approximate two weeks' supply, whichever quantity shall be the smaller.

For domestic uses: (A) No marketer shall sell or deliver to any consumer in district one fuel oil to be used for domestic heating if the consumer's stock of fuel oil at place of delivery exceeds 20% of the capacity of the tank into which delivery is to be made; (B) When the consumer's stock of fuel oil to be used for domestic heating is less than 20% of the capacity of the tank into which delivery is to be made, then any marketer may sell or deliver to such consumer such fuel oil as may be required, provided that the amount delivered to the consumer shall not be in excess of the amount required to bring the total contents of the tank up to 75% of the tank's capacity.

Exceptions: The foregoing restrictions on sale and delivery of fuel oil shall not apply to sales and deliveries of fuel oil to hospitals, or buildings used for hospitalization; to sales and deliveries of fuel oil for domestic use where the capacity of the consumer's tank is less than 200 gallons; to sales and deliveries of fuel oil to resellers or consumers at water terminal locations which require that larger storage be carried because of the probable inability to make additional deliveries when required due to the freezing of all or of a portion of the water route; and to sales and deliveries of fuel oil where delivery has heretofore been made and is normally made in ocean-going tankers. It is the intention of this plan that inventory stocks in the hands of resellers and consumers be kept to a reasonable minimum, and these exceptions shall not be applied in any manner so as to defeat this intention.

### Pipe Line Revived

Important among the supplementary plans under consideration is the proposal to revive, for consideration by the War Production Board, the question of the 24-inch pipe line from Texas to New York.

"Contrary to the belief in some quarters," said Coordinator Ickes, "the Supply Priorities and Allocations Board did not at any time say that the proposed pipe line was not a desirable project. Its ruling simply was that the steel that would have been required—456,000 tons for a capacity of 350,000 barrels daily—was needed more acutely for other projects. I did not assume then, and I do not assume now, to pass upon the question whether there is a more imperative need of steel for a pipe line or for other projects. But I believed then, and I believe now, that the line should be built—if the steel can be made available.

"I also repeat that I believed then, and I believe now, that it would be very comforting to have an underground transportation system, which could not be torpedoed nor sunk, delivering 350,000 barrels of oil every day into the great war-industry and thickly inhabited areas of the East.

"I am very thankful—and so are the people in the benefited regions that we do have three other new pipe lines. One is the Portland-Montreal line, completed last Fall, with a capacity of 60,000 barrels daily. This line is equivalent to 3½ tankers, plying the long and hazardous route up the Northeast Coast and down the St. Lawrence River.

"The next to be finished was the South Eastern line, now in full operation between Port St. Joe, Florida, and Chattanooga, and with a capacity of 30,000 barrels daily. It performs a service equivalent to that of three tankers.

"Scheduled for opening throughout its length early next month, is the 1,270-mile Plantation line, running from Baton Rouge, Louisiana, to Greensboro, North Carolina, by way of Atlanta, Georgia. This line has a capacity of 60,000 barrels of petroleum products daily, and will do the work of ten average tankers.

"As a step toward protecting East Coast supplies, I propose to ask the War Production Board to reconsider our application for priorities for the necessary steel and equipment for a 24-inch pipe line from Texas to New York."

## Colloids Are Not Scale Removers

LOS ANGELES—A talk on the proper use of chemicals in connection with colloids and their application to condenser water treatment, cooling towers and steam boilers was presented at the February meeting of the National Association of Practical Refrigeration Engineers by E. J. Whitlock, New York, vice-president of the American Colloid Corp.

Mr. Whitlock said it was a fallacy that colloids will remove scale from boilers. Colloids, he declared, can definitely be expected to prevent scale but will not remove it once it has formed.

Colloids, according to the speaker, offer definite control of pitting and, due to the adsorption qualities of colloidal gel, steam plant engineers may expect colloids to take care of a normal amount of oil and produce 20% dryer steam.

In their application to cooling towers and compressors, Mr. Whitlock said, colloids are definitely serviceable in preventing algae growth and corrosion.

The speaker emphasized the need of a proper balance of other chemicals whenever colloids are used, for the latter perform only 60% of any given job. The type of chemicals, he explained, depends upon the type of water being used, varying widely with different kinds of water.

## Ezra Frick

WAYNESBORO, PA.—Ezra Frick, 86, president and a director of Frick Co., manufacturers of air conditioning and refrigeration equipment, died Feb. 2 at his home here following a long illness.

A native of Ringgold, Md., Mr. Frick was educated at Chambersburg Academy. After serving four years as a machinist's apprentice, he became a refrigeration engineer and since 1875 had been with the Frick concern, which was founded in 1861 as a farm machinery firm by his father, George M. Frick.

Starting as a general clerk in the office, Mr. Frick served as secretary of the company from 1885 to 1906, and as general manager from 1897 to 1924, when he became president and a director.

Mr. Frick was a charter member of the ASRE and served as its president in 1918. He also was president of the Refrigerating Machinery Association in 1919-20; a founder of the Ice Machinery Builders Association in 1908; director of the Landis Tool Co.; and president and director of the Citizens National Bank and Trust Co., of Waynesboro.

Surviving are a daughter and a sister.

## Buffalo A.C. to Issue Booklet

BUFFALO—Suggestions and recommendations for adequate ventilation in air raid shelters are being prepared for the Buffalo and Erie County defense councils by the Air Conditioning Council of Western New York. When completed they will be incorporated in a booklet for public distribution, Sherman W. Strouse, vice president of the Council, has announced.

## Percy Nicholls

PITTSBURGH—Percy Nicholls, Supervising Engineer of the Fuels Section at the Central Experiment Station of the U. S. Bureau of Mines, died February 12 after a short illness.

Mr. Nicholls, who was born in London in 1870, came to the United States in 1897 when he served as engineer with the Westinghouse Electric and Manufacturing Company by whom he was sent to France in 1899 and 1900 to assist in the establishment of their plant at LeHavre. In 1915 he joined the Franklin Manufacturing Company where he became interested in heat transmission and combustion of solid fuels. In 1922 he joined the laboratories of the American Society of Heating and Ventilating Engineers and in 1925 was appointed to the position he held at the time of his death.

Mr. Nicholls was the author of more than fifty papers on technical subjects. He was an outstanding contributor to the literature on solid fuels, his papers on the fundamentals of combustion being accepted as classics. He also developed the Nicholls heat meter wherein the flow of heat through existing structures could be accurately determined, and from the results of which heat transmission coefficients were calculated.

He was a member of the ASME, a life member of the ASHVE, and a charter member of the Physical Society of Pittsburgh.

## Reginald P. Bolton

NEW YORK — Reginald Pelham Bolton, 86, died February 18 at his home after a short illness. He was president and chairman of the board of the Electric Meter Corporation and president of R. P. Bolton Co. As a consulting engineer, Mr. Bolton designed and erected machinery for mines, shipyards, marine engines, and power plants in all parts of the world.

Since 1893 Mr. Bolton had been actively engaged in consulting engineering in New York City, served as consulting engineer to the Department of Water Supply of New York, and among the engineering projects for which he had been responsible are the plant system of R. H. Macy & Co., Inc., and the Grand Central Terminal.

## Skagerberg, Dill Address ASHVE

WASHINGTON—Forty-five members and guests attended the February meeting of the local chapter ASHVE, held at the Dodge Hotel.

R. Skagerberg, U. S. Housing Authority, talked on Experiments With A Typical Residential Warm Air System. He presented data on actual operating costs and results of experiments conducted in his own home. Charts were presented which illustrated the results in an average residential job operated under everyday living conditions. His observations were of such interest to the members that he was requested to continue his individual research and report to the chapter during the next season.

Richard S. Dill, National Bureau of Standards, spoke on Residential Heating Systems During War Times.

## Charles Clarage

KALAMAZOO—Charles Clarage, president of Clarage Fan Company, died of a heart attack at his home here February 6. He was 81.

Shortly after leaving school, Mr. Clarage joined his father in a foundry and machine business. When the elder Clarage died in 1895, the business went to Charles Clarage and his two brothers. The brothers withdrew, however, and Charles carried on. Early in the present century, the foundry developed a stoker manufacturing business, and in 1912 it started building fans and blowers.

*Charles Clarage*

In 1915 the concern became known as the Clarage Fan Company, with Charles Clarage as president. He held this office until the time of his death.

He is survived by one son, Harry, Assistant General Manager of the Clarage Fan Company.

## E. F. Tilley

NEW YORK—Edwin Frost Tilley, 61, president of Tilco-Fin, Inc., of Brooklyn, manufacturers of extended surface tubing for air conditioning, heating and refrigerating equipment, died Feb. 20 at his home in Dunellen, N. J.

## Louis F. Fedders

BUFFALO—Louis F. Fedders, president and treasurer of the Fedders Manufacturing Co., Inc., for 22 years, died February 4 in his home here after a year's illness.

# SIZING FREON REFRIGERANT LINES

The six charts appearing on this sheet and on Reference Data Sheets 219-220 and 221-222 enable the user to size freon lines, determine the velocity of fluid travel, and estimate the cost of copper pipe and fittings. These charts, designed by William Parkerson, are based on the temperature equivalent (2F) of a conservative pressure drop. By survey, six elbows were found to be the average number to use when the exact number is not known. Table 1 gives the equivalent length of straight pipe to be added for elbows both in terms of one elbow or six.

Cost figures are on the basis of prices given in Table X (Sheet 219-220). Adjustment for current prices can be made in proportion.

Chart I is for the solution of liquid line problems. Charts II (other side this sheet), III, and IV (Sheet 219-220) are for suction line design. Charts V and VI (Sheet 221-222) are for hot gas line design.

On each chart the curve "Locus of Maximum Capacities" is for six elbows, and does not apply if more or less than six are used.

*Use of Chart I.* Since liquid line capacity is almost independent of variations in suction and/or condensing temperatures, only one chart is necessary for solving liquid line problems. *Example:* given, liquid temperature at condenser, 105F; liquid temperature at expansion valve, 103F, a drop

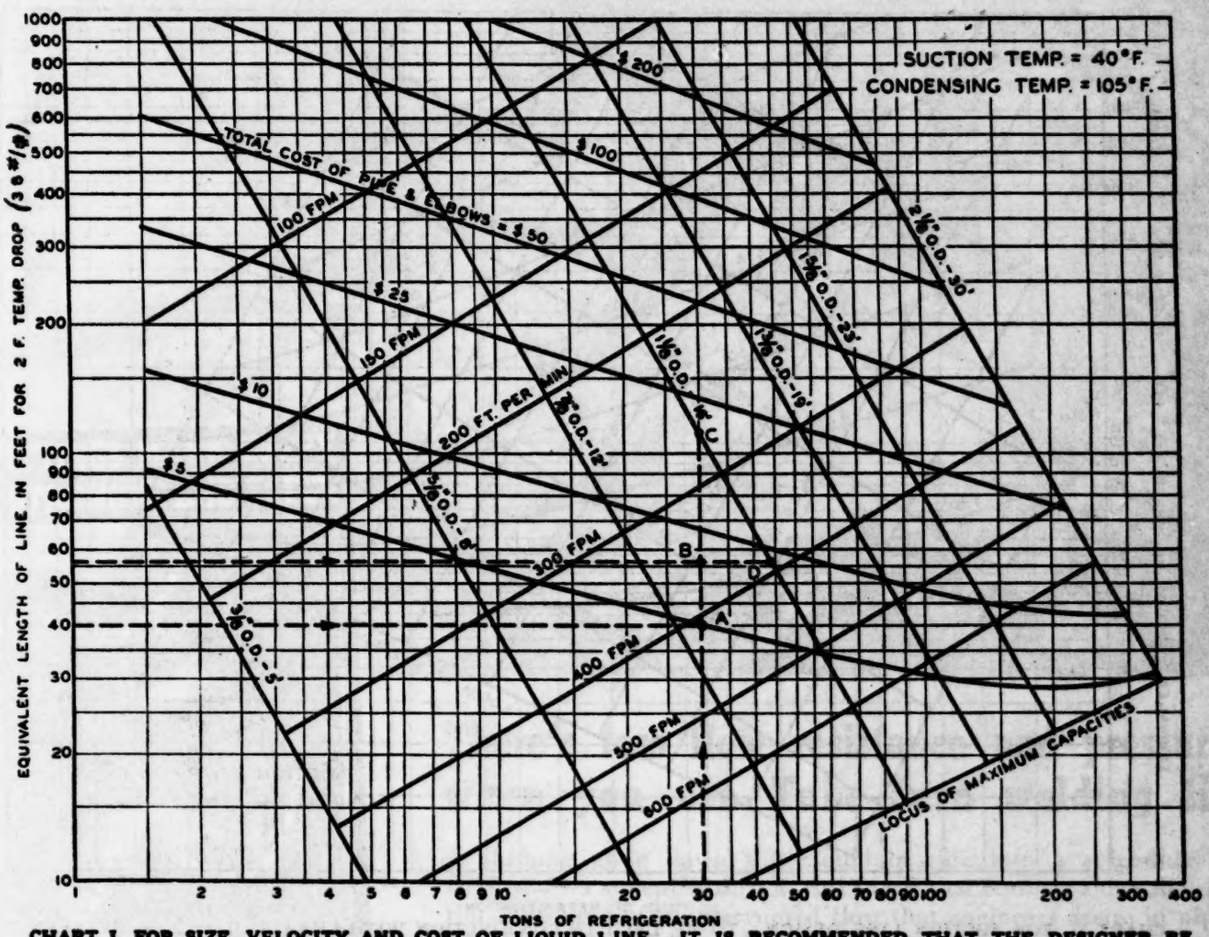



CHART I, FOR SIZE, VELOCITY AND COST OF LIQUID LINE. IT IS RECOMMENDED THAT THE DESIGNER BE LIBERAL IN LIQUID LINE SIZING, PREFERABLY ERRING ON THE TOO-LARGE SIDE.

*Published by* Heating and Ventilating, *148 Lafayette St., New York* 3/42 *Copyright, 1942, by* The Industrial Press

## H. & V.'s REFERENCE DATA — 217

TABLE 1.—EQUIVALENT LENGTH OF ELBOWS

| Line Size, In., O.D. | Equivalent Length of Pipe Added for Elbows, Ft.* | |
|---|---|---|
| | Per Elbow | For 6 Elbows |
| ⅜ | .788 | 4.725 |
| ½ | 1.363 | 8.175 |
| ⅝ | 1.963 | 11.775 |
| ⅞ | 2.563 | 15.375 |
| 1⅛ | 3.163 | 18.975 |
| 1⅜ | 3.763 | 22.575 |
| 1⅝ | 4.963 | 29.775 |
| 2⅛ | 6.163 | 36.975 |
| 2⅝ | 7.363 | 44.175 |
| 3⅛ | 8.563 | 51.375 |
| 3⅝ | 9.763 | 58.575 |
| 4⅛ | 12.188 | 73.125 |
| 5⅛ | | |

*When exact number of elbows is not known, use figure for 6 elbows. Otherwise, use unit elbow figure times number of elbows.

of 2F; 30 tons of refrigeration, 40 ft of straight pipe. *Solution.* Use Chart I. From 30 on lower scale move vertically to intersection (A) with horizontal line 40. On diagonal lines from upper left to lower right find pipe sizes. (A) falls between ⅞ and 1⅛. Use larger figure, 1⅛. In Table 1 for elbows, opposite 1⅛ find 15.375 (use 16) as equivalent length of elbows for average job. Add 16 to 40, and opposite 56 find B, between ⅞ and 1⅛. Pipe and fittings will be, therefore, 1⅛ in. Continue vertical line to 1⅛ line, and by interpolation find velocity 270 fpm. From B continue horizontal line to 1⅛ (D) and find cost, by interpolation, $9. Cost is based on Table X (Sheet 219-220). If current prices vary, correct accordingly and in proportion.

For sizing multiple lines, see Sheet 221-222.

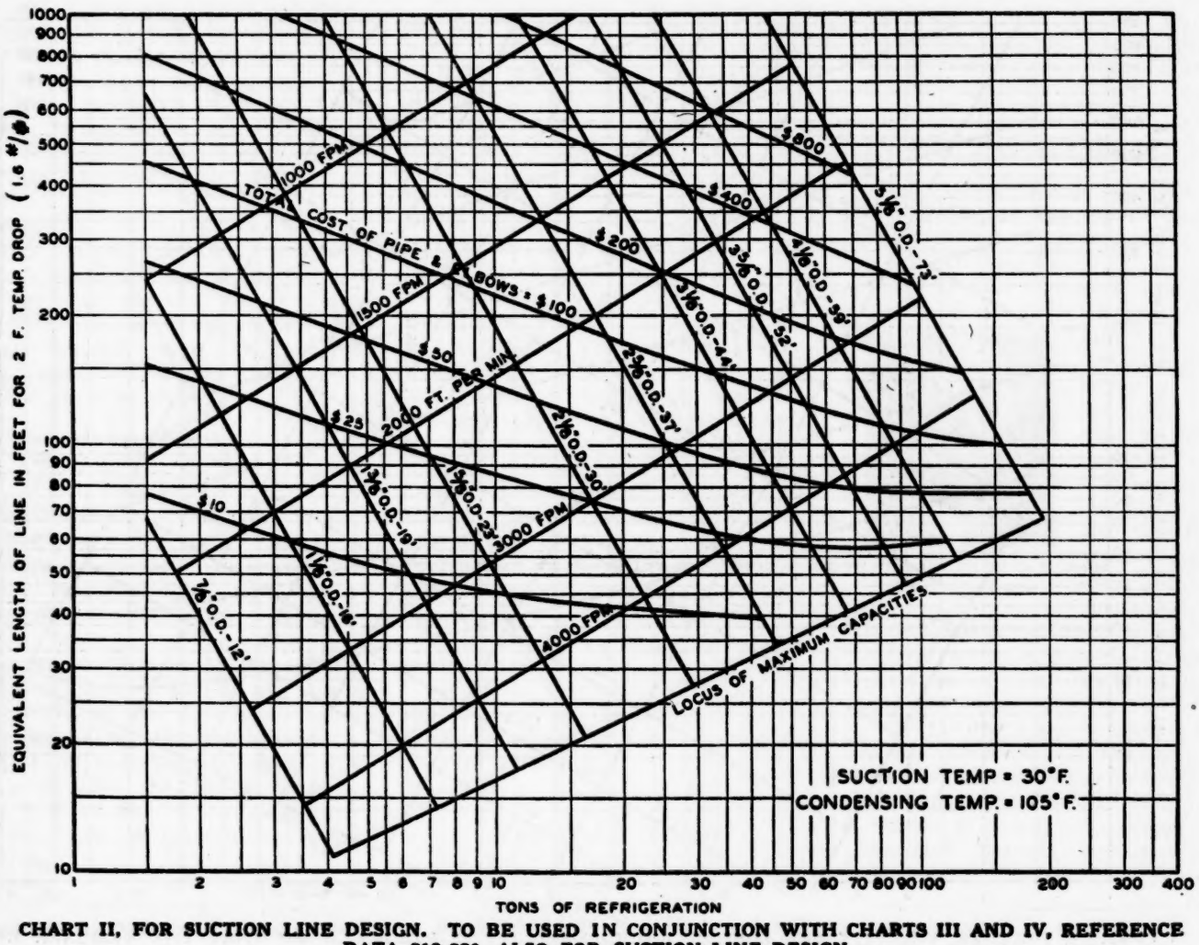



CHART II, FOR SUCTION LINE DESIGN. TO BE USED IN CONJUNCTION WITH CHARTS III AND IV, REFERENCE DATA 219-220, ALSO FOR SUCTION LINE DESIGN.

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THE DANGER LIES AT THE TURNS

# Taking the curves FAST is equally treacherous in piping!

## TUBE-TURN FITTINGS MAKE EVERY PIPE SYSTEM STRONGER AND SAFER

When pipe lines snake their way thru a plant like these chemical lines, forming neat, compact layouts, it's little wonder engineers insist on TUBE-TURN fittings. There are no flanges to tighten, no gaskets to replace—no chance of dangerous leakage. The turns indicated above *—where the danger lies*—are strong and safe—fully protected with TUBE-TURN welding fittings.

## There's less flow resistance and pressure loss when you use Tube-Turn welding fittings

A flashing glide down the mountain side into a splendidly executed *Kristiana*—a sweeping turn at full speed that scarcely slows the skier! It's the same kind of uninterrupted flow that engineers desire in piping—and TUBE-TURN welding elbows and returns assure minimum resistance, thanks to the easy sweeping radius throughout. TUBE-TURN fittings' smooth inner walls are free from waves, scales or ridges which often accelerate corrosion and erosion. TUBE-TURN fittings give *plus strength* where the danger lies—at the turns—wherever there is a change *in flow direction!* For safe, trouble-free piping systems, insist on TUBE-TURN welding fittings!

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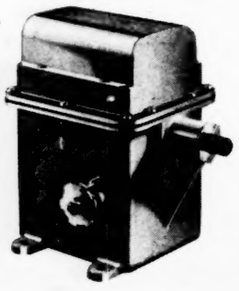
The ★ FIRST WELDING FITTINGS 1ST AND STILL THE BEST

*Welding Fittings*

# NEW EQUIPMENT



### Barber-Colman Microtrol

NAME—Microtrol.

PURPOSE — For operating butterfly valves, multiple ratio fuel valves, and regulation of dampers in air conditioning and drying systems.

FEATURES—A high torque proportioning control motor with built in limit switches and potential dividing rheostat. Output shaft is driven by company's shaded pole induction motor through gear reduction of machine cut, heat-treated gears. All oil-submerged units have operating mechanism completely submerged in oil and sealed in die-cast case.

LITERATURE AVAILABLE — Bulletin F-1420-3.

MADE BY—*Barber-Colman Company, Rockford, Ill.*

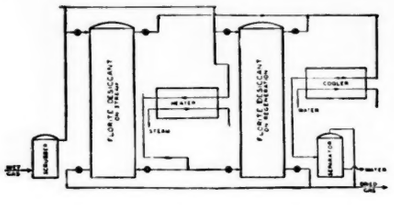
### Floridin Dehydration Equipment

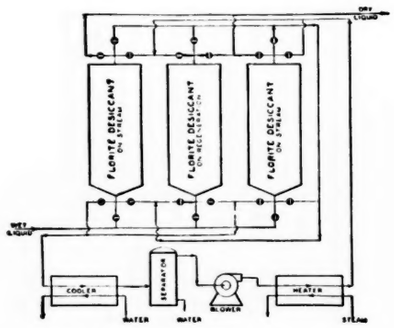
NAME—Florite dehydration plant.

PURPOSE — For removing moisture from gases, liquids, and air.

FEATURES—Florite desiccant is said to be a new granular drying agent for gases and liquids. Manufacturer states that the outstanding characteristic of Florite desiccant is its ability to maintain a high drying efficiency under a wide variety of conditions. It is said to adsorb water instantly and will not swell, disintegrate, or appear wet at the end of an adsorption cycle. It is further stated that it is hard, stable, and non-corrosive. True specific gravity is 3.40. Apparent density when packed in a column is approximately 50 lb per cu ft, and its specific heat is .24. It is said to have the ability to adsorb 4 to 20% of its weight from gases before regeneration. The desiccant can be regenerated either by circulating pre-heated gases through the bed or the bed may be heated by imbedded steam coils. It is further stated that temperatures as high as 900F will not injure the desiccant but the preferred reactivation temperature is 350 to 500F. According to the manufacturer, among the products successfully being dehydrated are natural gas, propane, gasoline, nitrogen, and carbon dioxide. The desiccant may also be used for breathers for storage tanks and electrical transformers, to dehumidify air in air conditioning systems and to dehydrate refrigerants.

MADE BY — *Floridin Company, Inc., Warren, Pa.*




*(Top) Dehydration plant for gases. (Below) Dehydration plant for liquids.*

### Tal's Pipe Bender

NAME—Tal's Prestal.

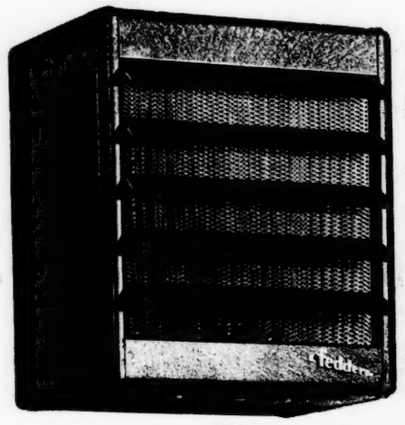
PURPOSE — For bending iron and steel pipe.

FEATURES — A portable hydraulic pipe bending machine for making one pipe bend in about two minutes without expansion and troublesome fittings in a single operation without moving pipe. Bend is said to be smooth and uniform without kinks or wrinkles.

SIZES AND CAPACITIES—Bends iron and steel pipe, regardless of weight or gauge, also heavy and double extra heavy pipe. Machine has an overall length of 32 in. and can be set up without bolting in less than one minute.

LITERATURE AVAILABLE — Four-page leaflet.

MADE BY—*Tal's Prestal Bender, Inc., 4051 South Iowa Ave., Milwaukee, Wis.*



### Fedders Series 4 Heaters

NAME — Fedders Series 4 Lo-Temp unit heaters.

PURPOSE—For new and modernizing applications in industrial and commercial buildings.

FEATURES—Performance characteristics include desirable conditions of low final temperatures combined with large cfm and long range heat distribution. Streamlined tubes and latest type, wide blade fans result in unusually quiet operation. Units designed to operate on steam pressures up to 150 lb., with emphasis on low final temperature.

SIZES AND CAPACITIES — Built in 12 capacities ranging from 75 EDR to 1200 EDR.

LITERATURE AVAILABLE—Catalog AC 574.

MADE BY — *Fedders Manufacturing Co., Inc., 11 Tonawanda St., Buffalo, N. Y.*

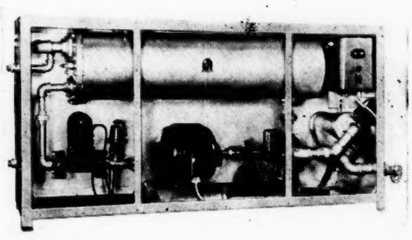
### B&G Oil Cooler

NAME—B & G Rapid oil cooler.

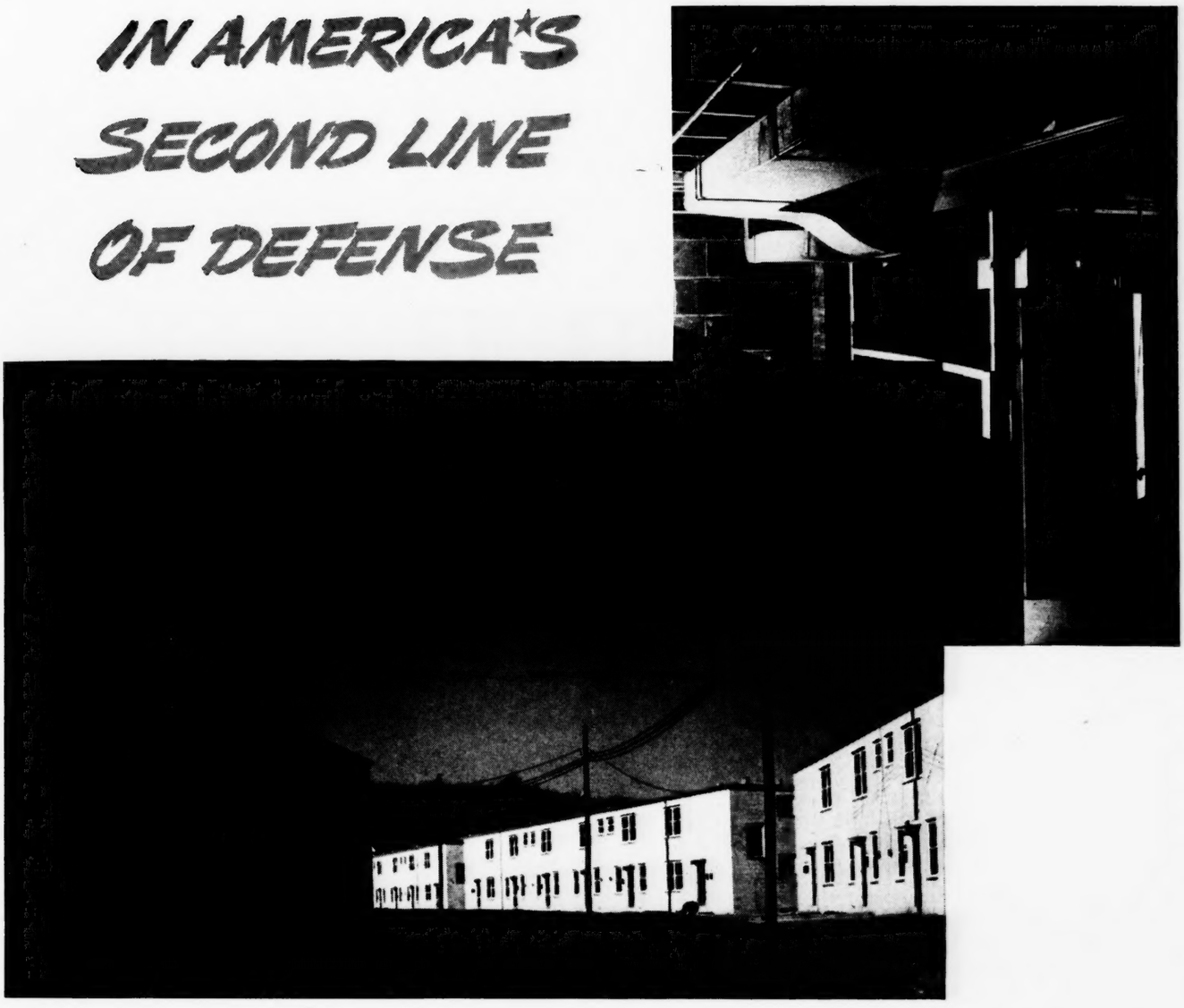
PURPOSE — To maintain a constant temperature in oil quench bath in heat treating metals.

FEATURES—Unit combines all necessary equipment except the quench tank, in a single compact package. Covers wide range of capacities from smallest to largest.

MADE BY—*Bell & Gossett Company, Morton Grove, Ill.*



# IN AMERICA'S SECOND LINE OF DEFENSE



## BETHLEHEM GALVANIZED STEEL SHEETS

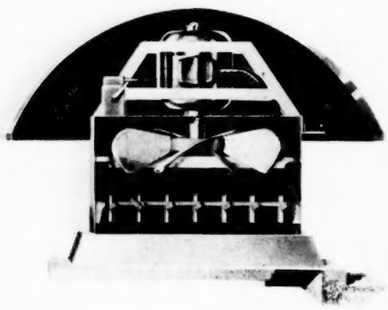
Here's a phase of America's war effort that gives even the smallest contractor or sheet-metal shop a chance to help. It's an emergency housing project located near a newly expanded plant devoted to war production.

Heating in the houses illustrated is done with individual hand-fired warm-air coal furnaces. A single horizontal warm-air duct in the basement serves all rooms through risers. By skillful layout, three risers furnish air to five rooms on the two floors, a main riser carrying vents on both floors, while the other two serve one floor each. Vents are strategically located in each of the rooms to feed off the risers with a minimum amount of extra ductwork, thus conserving valuable materials. Cold-air return is through one large vent in the main ground-floor room.

Throughout this entire emergency housing project, as in many another vital phase of America's war effort, Bethlehem Galvanized Steel Sheets were used.

BETHLEHEM STEEL

**BETHLEHEM STEEL COMPANY**

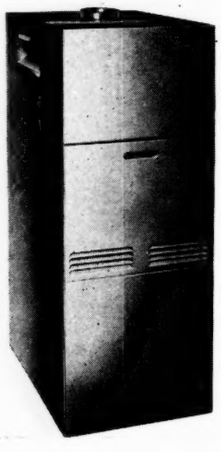


### Trane Blackout Ventilators

NAME—Trane Blackout ventilators.
PURPOSE—A light-proof ventilator.
FEATURES—Trane blackout ventilators are available in three basic models: (1) exhaust unit, (2) summer supply unit, and (3) winter supply unit. The summer supply unit is designed to provide large volumes of outside air for ventilation and for reducing solar heat gains. The exhaust unit has the same general design as the supply unit and is merely an exhaust fan arrangement. The winter supply unit is designed for application in conjunction with the existing heating system and contains heating coils, face and bypass dampers and a propeller fan. Manufacturer states that these ventilators are easy to install and the provision of a simple curb is all that is required. The units include grease-lubricated motors and all maintenance can be accomplished from the rooftop.
CAPACITIES — From 1500 to 20,000 cfm.
MADE BY — *The Trane Company, La Crosse, Wis.*

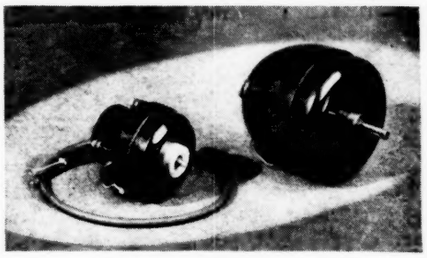
### Janitrol Gas Furnace

NAME—Janitrol gas-fired conditioner Series FCS.
PURPOSE—For defense housing work.
FEATURES—Incorporates Multi-Thermex heat exchangers and Amplifire burner, consisting of a battery of heavy gauge steel tubes, vertically placed with horizontal fins projecting into air stream, thus giving maximum heat transfer area. Each tube equipped with internal heat absorbers. Amplifire burner is constructed of gray iron into which are welded series of corrugated strips forming burner ports. This construction results in clear flame that travels rapidly along ports and with long range of turn-down combined with quiet operation. Blower fan is motor-driven through V-belts. Controls are enclosed inside the casing and are accessible from front.
SIZES AND CAPACITIES—Three capacities: in 60,000, 75,000 and 90,000 Btu input. Outside dimensions of the casing of the 60,000 and 75,000 Btu sizes are 49-3/16 in. high, 18-⅜ in. wide and 26 in. deep. Limited floor space required makes it possible to install the unit not only in basement, if there is one, but in a small closet, utility room, corner of kitchen, or other unusual locations.
LITERATURE AVAILABLE—Descriptive folder—"Janitrol FCS Furnace for Victory Housing."
MADE BY—*Surface Combustion, Toledo, Ohio.*



### Carey Blackout Supplies

NAME—Blackout materials.
PURPOSE—To meet requirements involved in blackouts.
FEATURES—(1) Company provides a blackout coating applied as paint for either inside or outside application to prevent light reflection on skylights. (2) Company recommends any one of three types of its blackout board to prevent injuries from flying glass. These boards, of laminated asphaltic composition, cut to window size, are recommended by manufacturer for application to the inside of windows. Said to be of good rigidity, moisture and condensation proof, easily installed and quickly removable. (3) For permanent, weather-proof, exterior blackout treatment the company has developed Carey laminated system, consisting of the application of a thick film of asphaltic coating, in which is embedded an asphaltic-saturated fabric membrane, topping this with a finish of the asphaltic coating. This treatment, it is asserted, effects a complete blackout and renders the glass shatterproof. (4) An emergency blackout paper for temporary repairs to damaged blackout materials over windows is available in the company's smooth roll roofing or the less expensive asphalt-saturated building paper. (5) Camouflage system. During past year the company has developed the Rejuvo system of camouflage said to offer exclusive advantages. This material and equipment for its application available through the company's branch offices.
INFORMATION FROM—Dept. 49.
MADE BY—*The Philip Carey Mfg. Company, Lockland, Cincinnati, Ohio.*



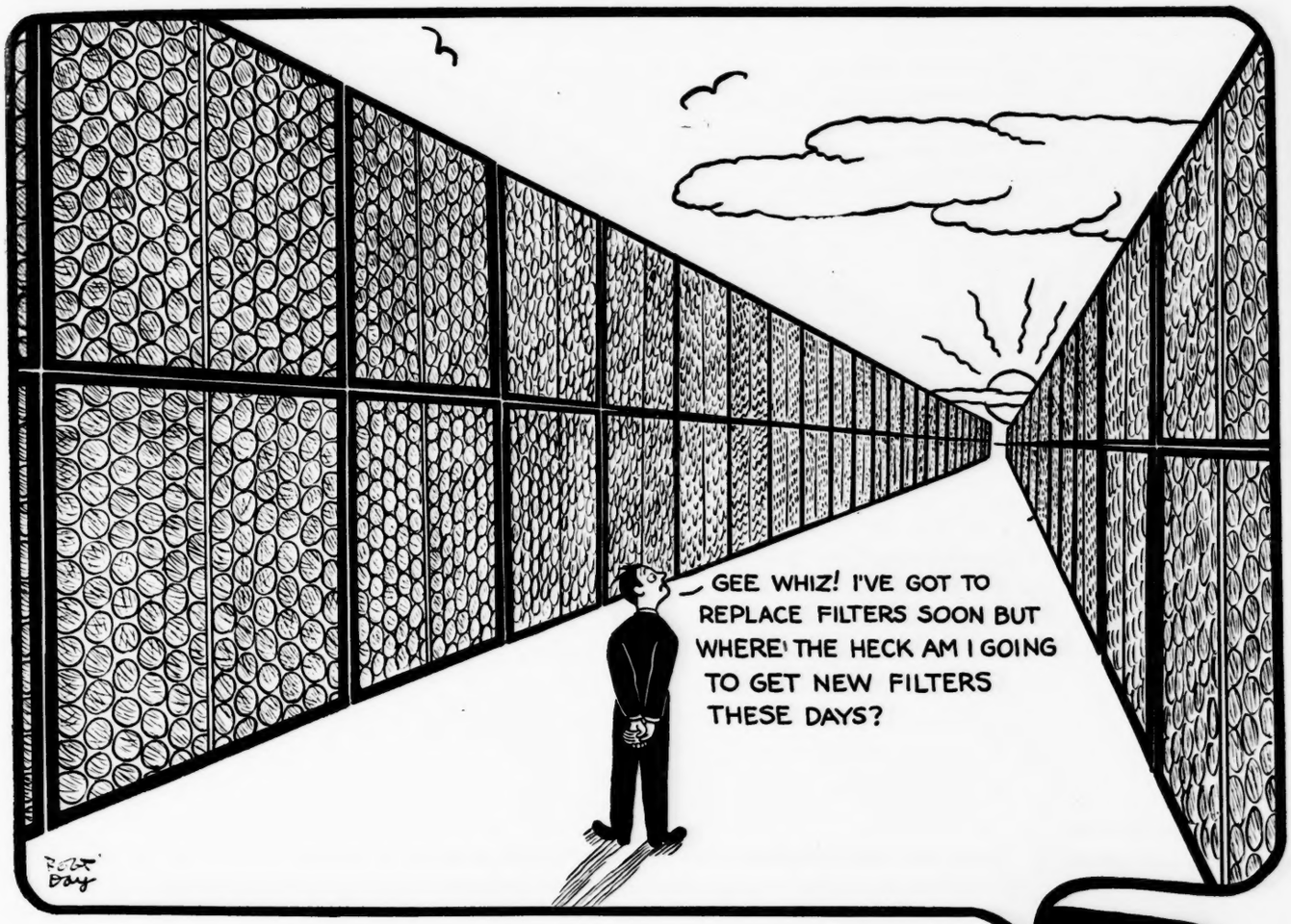
### G.E. Fan Motors

NAME—General Electric unit-bearing, shaded-pole fan motors, frames 51AL, 51EL and 71GL.
PURPOSE — For use where a short, quiet, compact motor is desired and especially for commercial refrigeration, air conditioning and ventilating systems.
FEATURES— Bearings and motor core are machined in one setup in single cast member, assuring uniform air gap and true bearing alignment necessary for quiet operation and good performance. A large oil reservoir provides for many years of operation without reoiling. End-bump and axial-thrust forces are counteracted by magnetic forces tending to hold rotor in alignment with stator. This arrangement provides frictionless, non - wearing thrust arrangement, and permanent, free-operating, unchangeable end-bump take-up.
SIZES AND CAPACITIES — In three models, all for 115-volt, 60-cycle operation. Frame 51AL operates with or without air over motor at 1.5 watts, 1550 rpm, and with air over motor at 3 watts, 1400 rpm; Frame 51EL requires air over the motor at 9 watts, 1550 rpm, and operates with or without air over the motor at 3.5 to 6 watts at 1550 rpm; Frame 71GL is rated 1/40 and 1/25 hp, 1550 rpm, air over the motor, and is for use with direct-connected propeller fans only.
MADE BY—*General Electric Company, Schenectady, New York.*

### Sal-Mo Ductboard

NAME—Sal-Mo asbestos ductboard.
PURPOSE—To replace steel in making cold air return ducts.
FEATURES — Moist resistant, being treated on both sides and all four edges; easily handled, saving time in application. A pair of snips, hammer and wall board nails are all that are required for neat, speedy application. Handy stapler is also used to advantage. Finished in an attractive gray and can be painted any color to harmonize with surroundings.
SIZES AND CAPACITIES—Size of sheet is 33 in. x 48 in. for covering three joists spaced at 16 in. centers, making two cold air return ducts.
MADE BY—*Sall Mountain Company, 176 West Adams St., Chicago, Ill.*

## WARTIME "NIGHTMARES" THAT JUST AIN'T SO




# Dust-Stop deliveries are as speedy as ever!

**FLASH!** Dust-Stop* Air Filters are U.S. citizens . . . from 'way back! Ample stocks are warehoused by distributors from coast to coast. This means you *won't* have to wait when you order Dust-Stops! Deliveries are as prompt as in peace times!

**CHALK** up these big points to Dust-Stops, too. They have NO moving parts to repair or replace. They DON'T require skilled supervision. They're easy to change . . . easy to clean. They're fire-safe. And, man, are these four-star advantages today! In addition . . .

**EFFICIENCY** and Dust-Stops go hand in hand. They *remove* virtually all "nuisance" dust. Capacity: 2 CFM per square inch of area at 300 FPM.

**DOES** economy interest you? We thought so! Well, once again Dust-Stops come to the rescue. You see, Dust-Stops cost only about 1 cent per CFM to install . . . about 1/10 cent per CFM when filters need changing. You can make even greater savings by gently tapping them out, or vacuum-cleaning them, where dust is heavy.

**SO,** you can get rid of your air filter worries . . . with ease. Order Dust-Stops . . . today. They come in two sizes, No. 1 (1-inch), No. 2 (2-inch). You can order them from air-conditioning manufacturers, jobbers, or dealers. Or write us.

**No priorities . . . No rationing of**

## FIBERGLAS* DUSTOP* AIR FILTERS

*T. M. REG. U. S. PAT. OFF.

*Made by Owens-Corning Fiberglas Corporation, Toledo, Ohio.*
*In Canada, write to Fiberglas Canada, Ltd., Oshawa, Ontario.*

# Number of Degree-Days for January, 1942

**HEATING AND VENTILATING continues its fourteenth year of publishing degree-day data for various large cities.**

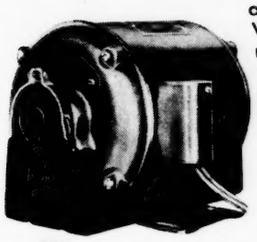
| City | Degree-Days Jan. 1940 | Degree-Days Jan. 1941 | Degree-Days Season 1941-42 |
|---|---|---|---|
| Albany, N. Y. | 1447 | 1332 | 3675 |
| Alpena, Mich. | 1371 | 1354 | 3881 |
| Atlanta, Ga. | 658 | 706 | 1654 |
| Atlantic City, N. J. | 951 | 974 | 2330 |
| Baker, Ore. | 1014 | 1281 | 4071 |
| Baltimore, Md. | 940 | 905 | 2138 |
| Binghamton, N. Y. | 1282 | 1248 | 3347 |
| Birmingham, Ala. | 569 | 689 | 1540 |
| Bismarck, N. D. | 1655 | 1414 | 4550 |
| Boise, Idaho | 982 | 1373 | 3648 |
| Boston, Mass. | 1228 | 1132 | 2954 |
| Buffalo, N. Y. | 1258 | 1264 | 3325 |
| Burlington, Iowa | .... | 1254 | 2174 |
| Burlington, Vt. | 1601 | 1466 | 4213 |
| Cairo, Ill. | 815 | 957 | 2257 |
| Canton, N. Y. | 1637 | 1529 | 4355 |
| Charles City, Iowa | 1384 | 1457 | 3888 |
| Charlotte, N. C. | 699 | 704 | 1679 |
| Chattanooga, Tenn. | 744 | 852 | 2086 |
| Cheyenne, Wyo. | 1078 | 1257 | 4087 |
| Chicago, Ill. | 1145 | 1222 | 3081 |
| Cincinnati, Ohio | 996 | 1043 | 2592 |
| Cleveland, Ohio | 1097 | 1135 | 2919 |
| Columbia, Mo. | 964 | 1053 | 2647 |
| Columbus, Ohio | 1036 | 1103 | 2770 |
| Concord, N. H. | 1384 | 1388 | 4011 |
| Concordia, Kan. | 1091 | 1125 | 3003 |
| Davenport, Iowa | 1178 | 1268 | 3186 |
| Dayton, Ohio | 1075 | 1094 | 2784 |
| Denver, Colo. | 950 | 1087 | 3266 |
| Des Moines, Iowa | 1223 | 1285 | 3328 |
| Detroit, Mich. | 1204 | 1213 | 3176 |
| Dodge City, Kan. | 973 | 1035 | 2803 |
| Dubuque, Iowa | 1244 | 1336 | 3433 |
| Duluth, Minn. | 1602 | 1489 | 4658 |
| Eastport, Me. | 1427 | 1390 | 4125 |
| Elkins, W. Va. | 1051 | 1103 | 2975 |
| El Paso, Tex. | 567 | 537 | 1482 |
| Erie, Pa. | 1134 | 1168 | 2977 |
| Escanaba, Mich. | 1381 | 1425 | 4117 |
| Evansville, Ind. | 927 | 1069 | 2619 |
| Fort Smith, Ark. | 676 | 851 | 1971 |
| Fort Wayne, Ind. | 1167 | 1225 | 3257 |
| Fort Worth, Tex. | 523 | 683 | 1535 |
| Grand Rapids, Mich. | 1203 | 1216 | 3205 |
| Green Bay, Wis. | 1370 | 1431 | 3835 |
| Greensboro, N. C. | 839 | 883 | 2166 |
| Harrisburg, Pa. | 1097 | 1115 | 2790 |
| Hartford, Conn. | 1282 | 1237 | 3266 |
| Helena, Mont. | 1319 | 1709 | 4985 |
| Huron, S. D. | 1515 | 1314 | 3965 |
| Indianapolis, Ind. | 1046 | 1105 | 2722 |
| Ithaca, N. Y. | 1272 | 1242 | 3400 |
| Kansas City, Mo. | 1013 | 1038 | 2602 |
| Kewanee, Ill. | 1110 | 1186 | 3051 |
| Knoxville, Tenn. | 756 | 848 | 2046 |
| La Crosse, Wis. | 1353 | 1367 | 3720 |
| Lander, Wyo. | 1372 | 1680 | 4892 |
| Lansing, Mich. | 1246 | 1294 | 3452 |
| Lewiston, Maine | 1447 | 1416 | 4174 |
| Lincoln, Neb. | 1182 | 1174 | 3210 |
| Little Rock, Ark. | 642 | 782 | 1871 |
| Los Angeles, Calif. | 226 | 208 | 611 |
| Louisville, Ky. | 896 | 1000 | 2371 |
| Lynchburg, Va. | 848 | 851 | 2075 |
| Madison, Wis. | 1332 | 1385 | 3669 |
| Marquette, Mich. | 1367 | 1372 | 4112 |
| Memphis, Tenn. | 673 | 873 | 2051 |
| Milwaukee, Wis. | 1225 | 1400 | 3655 |
| Minneapolis, Minn. | 1478 | 1379 | 4013 |
| Nantucket, Mass. | 1062 | 1044 | 2766 |
| Nashville, Tenn. | 758 | 889 | 2063 |
| New Haven, Conn. | 1184 | 1131 | 2891 |
| New Orleans, La. | 290 | 420 | 809 |
| New York, N. Y. | 1089 | 1056 | 2588 |
| Norfolk, Va. | 760 | 742 | 1632 |
| Northfield, Vt. | 1623 | 1471 | 4446 |
| North Platte, Neb. | 1153 | 1205 | 3516 |
| Oklahoma City, Okla. | 733 | 839 | 2083 |
| Omaha, Neb. | 1211 | 1233 | 3361 |
| Oswego, N. Y. | 1313 | 1277 | 3507 |
| Parkersburg, W. Va. | 978 | 1026 | 2597 |
| Peoria, Ill. | 1136 | 1224 | 3069 |
| Philadelphia, Pa. | 1030 | 1008 | 2400 |
| Pittsburgh, Pa. | 1045 | 1031 | 2653 |
| Pocatello, Idaho | 1196 | 1480 | 4373 |
| Portland, Me. | 1479 | 1368 | 3959 |
| Portland, Ore. | 648 | 880 | 2392 |
| Providence, R. I. | 1195 | 1117 | 2987 |
| Pueblo, Colo. | 997 | 1133 | 3372 |
| Raleigh, N. C. | 748 | 756 | 1744 |
| Reading, Pa. | 1088 | 1083 | 2695 |
| Reno, Nev. | 840 | 1129 | 3302 |
| Richmond, Va. | 871 | 876 | 2053 |
| Rochester, N. Y. | 1309 | 1257 | 3461 |
| Roseburg, Ore. | 606 | 678 | 2237 |
| St. Joseph, Mo. | 1077 | 1136 | 2879 |
| St. Louis, Mo. | 920 | 1007 | 2447 |
| Salt Lake City, Utah | 1004 | 1379 | 3550 |
| Sandusky, Ohio | 1125 | 1146 | 2936 |
| San Francisco, Calif. | 340 | 431 | 1220 |
| Sault Ste. Marie, Mich. | 1567 | 1565 | 4655 |
| Scranton, Pa. | 1227 | 1194 | 3161 |
| Seattle, Wash. | 593 | 688 | 2320 |
| Spokane, Wash. | 1023 | 1312 | 3854 |
| Springfield, Ill. | 1057 | 1111 | 2766 |
| Springfield, Mo. | 877 | 1044 | 2660 |
| Syracuse, N. Y. | 1316 | 1265 | 3499 |
| Tacoma, Wash. | 638 | 772 | 2568 |
| Terre Haute, Ind. | 1019 | 1090 | 2679 |
| Toledo, Ohio | 1168 | 1194 | 3086 |
| Trenton, N. J. | 1098 | 1076 | 2665 |
| Utica, N. Y. | 1421 | 1335 | 3695 |
| Washington, D. C. | 936 | 936 | 2242 |
| Wichita, Kan. | 948 | 1023 | 2654 |
| Yakima, Wash. | 988 | 1229 | 3407 |

Figures in this table, with three exceptions, are calculated by HEATING AND VENTILATING from local weather bureau reports. Exceptions are Utica, Lewiston, and Kewanee, figures for which are furnished through the courtesy of R. C. Edmunds, Manager of Coke Sales, Central New York Power Corp., Utica, N. Y.; Norman E. Ross, Bursar, Bates College, Lewiston, Me.; and J. M. Hartman, Engineering Department, Kewanee Boiler Corp., Kewanee, Ill., respectively. HEATING AND VENTILATING will welcome an opportunity to make arrangements with readers who are keeping degree-day records over a period for important communities not listed above in order to make such data available to the industry.

# *There is a* WAGNER MOTOR

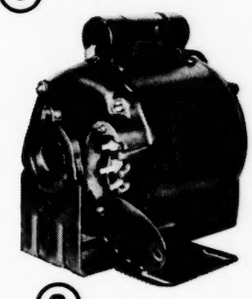
## for every Air-Conditioning Equipment Need...

No matter what type of air-conditioning equipment is involved ... whether large or small ... regardless of the torque, speed or current requirements, you can choose a motor from the Wagner line that is correctly engineered for the job. The eight motors illustrated represent the types of Wagner motors most frequently used for air-conditioning appliances. Each motor has special electrical or mechanical characteristics that make it the ideal motor for certain applications.



①

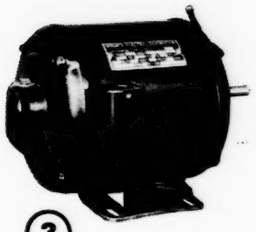
**1. TYPE RA REPULSION-START-INDUCTION MOTORS** are single-phase brush-lifting motors having high starting-torque and low starting-current. The ideal motor for heavy-duty applications such as stokers, compressors, pumps, etc. Obtainable in various speeds, frequencies, and voltages; rigid or resilient mounted; 1/8 to 15-hp.



②

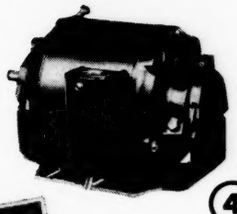
**2. TYPE RK CAPACITOR-START INDUCTION-RUN MOTORS** are single-phase motors suitable for driving refrigerators, household air-conditioners, and other appliances. Drip-proof or totally-enclosed endplates; rigid or resilient mounted; 1/8 to 3/4-hp.

**3. TYPE TB SPLIT-PHASE UNIT HEATER MOTORS (SINGLE-PHASE)** are totally-enclosed to prevent entrance of dust or moisture; ball-thrust bearings on front end to take care of end-thrusts imposed by fans; rubber mounted for ultra-quiet operation. 1/20 to 1/4-hp.



③

**4. TYPE M SHADED-POLE FAN MOTORS** are single-phase induction motors of simple construction. Ideal for fan and blower drives in which the fans are mounted directly on the motor shaft. Totally-enclosed and open-type; rigid or resilient mounted; 1/125, 1/80 to 1/40 and 1/30-hp.



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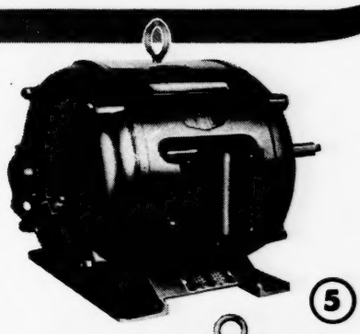
**5. TYPE RP POLYPHASE SQUIRREL-CAGE MOTORS** are made in 5 electrical types varied as to torque and current characteristics to take care of a wide variety of applications. 2 and 3-phase; 1/6 to 400-hp.



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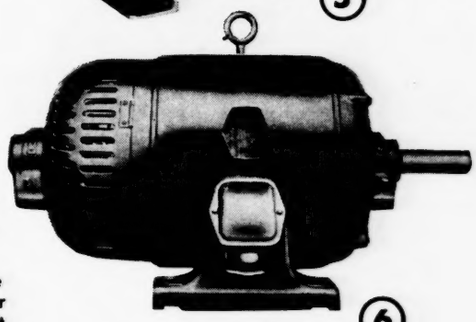
**6. TYPE RT SPECIAL COMPRESSOR MOTORS** were developed to meet the demand for a polyphase motor with high starting-torque and very low starting-current. The RT motor is ideal for large compressors. The very low starting-current permits across-the-line starting. 2 and 3-phase; 40 to 100-hp.



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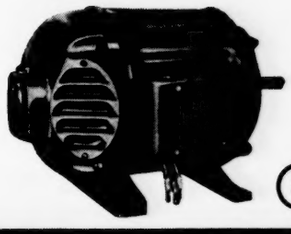
**7. TYPE RS WOUND ROTOR (SLIP-RING) POLYPHASE MOTORS** have adjustable varying speeds and combine the ability to start extremely heavy loads with good running characteristics. Smooth starting and adjustable varying speeds are effected by the use of external resistors. 1 to 250-hp.

⑦

**8. TYPE RD DIRECT-CURRENT MOTORS** may be used for direct-current service wherever repulsion-start-induction, split-phase, capacitor, or squirrel-cage motors would be used for alternating current service. Built in two types: Appliance Type up to 1 1/2-hp; Industrial Type, 2 and 3-hp.



⑧

### *Send for Free Bulletins*

Bulletins MU-182 and MU-183 contain information that is necessary in the selection of the right motor for the job.

### AIR-CONDITIONING ENGINEERS AND CONTRACTORS

**Don't Let Service Calls Eat Up Your Profits!**

Service calls during the guarantee period reduce your profits. Minimize these calls by installing dependable, trouble-free Wagner motors. On your next motor installation choose Wagner motors and protect your profit.

M42-7

**Wagner Electric Corporation**

6400 Plymouth Avenue, Saint Louis, Mo., U.S.A.

MOTORS • TRANSFORMERS • FANS • BRAKES

## WITH THE MANUFACTURERS

*The Schaible Foundry and Brass Works,* Cincinnati, *Mike Schaible,* president, announces the acquisition of the line of Kelly automatic steam, air and vacuum valves and the Eureka line of low-pressure valves and fittings. Purchases consisted of the Kelly Division, National Metal Products Corp., Chicago, and the Eureka Div., The Ohio Pattern Works and Foundry Co., Cincinnati. These two lines now become an integrated part of the Schaible line. Until present inventory stocks are exhausted in these two lines, no change will be made in the trade name of the lines. An original trade-mark for the new and old line will soon appear on all the company's articles. Simultaneously it is reported that the present Company name will be supplanted by another more closely allied with the new manufacturing set-up.

To make room for the new lines, a new building containing 30,000 sq ft of floor space has been added to the present Schaible plant, making a total of 74,000 sq ft of floor space now being devoted to heating and plumbing. The building is of glass-brick with air-conditioned offices.

Already in production at the Schaible plant is the new Victory line of sink strainers and deck-type faucets, made of non-critical materials, put into production, and sold profitably. This line not only conforms to the new housing critical list, but goes beyond that in the conservation of critical materials. Whereas the old line of sink fittings formerly required 7 lb of brass per sink, the new line uses only ½ lb and will result in a saving of an excess of ½ million lb of brass in the Schaible plant alone over a three-month period. Strainers in the new line are made without brass; bodies are of deep-drawn enameled steel; the trim is entirely non-metallic, being made of porcelain enamel and glass.

Schaible has also set up a defense products department, in order to speed the fulfilling of prime contracts for ordnance items. A wide advertising campaign with Perry-Brown, Inc., Cincinnati, as advertising agency, to announce the Victory line, as well as the new line of steam, water and air valves, is currently under way.

*Pomona Pump Co.,* vertical pump manufacturer, announces the purchase of the Westco Pump Division of Micro-Westco, Inc., Bettendorf, Iowa. The newly acquired business will be operated as Pomona Pump Co., Westco Division, at 2621 Locust Street, St. Louis, Mo., and manufacture continued from the St. Louis plant of the Pomona Pump Co. Management and key personnel of Westco will be transferred to St. Louis to continue the manufacture and distribution of the line of Westco pumps through the same national organization which has been built up by Westco over the past sixteen years.

*Bell & Gossett Company,* Morton Grove, Ill., the opening of whose new plant was reported on these pages last month, is located in Morton Grove, Ill., and not in Mendota as was stated in last month's item.

*Allis-Chalmers,* Milwaukee, announces that *Walter Geist,* vice-president, will head a new department established to coordinate the company's sales policies.

*Penn Electric Switch Co.,* Goshen, Ind., has moved its Chicago office from 844 Rush St., to 520 N. Michigan Ave. Telephone numbers remain unchanged, namely, Superior 0726 and 0727.

*The Foxboro Company,* Foxboro, Mass., is celebrating the tenth anniversary of its pyrometer department which began operations Jan. 2, 1932, carrying on the production of a line of instruments begun under the name of Wilson-Maeulen Co. in 1907. The company reports that 14 individuals of this original group are part of the pyrometer department today as follows: *C. J. Brown, W. G. McAllister, O. S. Michael, Wm. Livesey, Alex McCrary, E. A. Williams, Phillip Traphagen, Izaac Fleischmann, S. C. Horn, George Smith* and *Louise Zielke,* all of Foxboro, and *Harvey Lee,* Pittsburgh; *Carl Hellenberg,* Detroit, and *Milton A. Schreiner,* Chicago.

*Carrier Corp.,* Syracuse, N. Y., has designed a new marketing plan to expedite the handling of its war business, to simplify field operations, and to bring closer cooperation between dealers and branches. Under the plan the United States, east of the Rocky Mountains, is divided into three districts: Eastern, Western, and Southern. *James A. Bentley,* vice-president of Carrier, becomes head of the Eastern region; *Arthur P. Shanklin,* recently elected vice-president, heads the Western region; and *O. W. Bynum,* has charge of the Southern region as manager. Headquarters for the Eastern region will be New York; the Central region, Chicago; and the Southern region, Dallas.

*The Seamless Steel Tube Institute,* Gulf Building, Pittsburgh, Pa., announces the establishment of a new service whereby purchasers may obtain information on the availability of various grades and sizes of seamless steel tubing for new or special wartime requirements. This step, it is explained, was taken for the benefit of two classes of tube purchasers. First, are those who have bought certain grades of tubing for use in peace-time products, but may be unfamiliar with sources of supply for other or special grades of tubing required for war equipment. Second, and perhaps more frequently encountered today, are those manufacturers who never before needed seamless steel tubing.

## PERSONALS & PERSONNEL

*C. A. Breen,* vice president and general manager of the Sylvestre Oil Company since 1937, has been appointed assistant manager of the New York state division of Colonial Beacon Oil Company, with offices in New York. Mr. Breen will continue as vice-president of Sylvestre, which is a Colonial Esso Marketer of industrial and domestic fuel oils and oil burners in the New York metropolitan area, Westchester, and Fairfield county in Connecticut. New general manager of Sylvestre is *George A. Holton,* former assistant manager, who will be succeeded by *Arnold B. Smith,* operations manager.

*Wolverine Tube Company,* Detroit, announces the resignation of *J. D. Colyer* as director and vice-president in charge of sales. Supervision of all sales work will continue under the direction of *Otto Klopsch,* vice-president and general manager, with *Robert Moody* as special assistant, *William Gernhart* as office sales manager, and *John Marshall* heading the publicity department and electrical sales.

*Penn Electric Switch Co.,* Goshen, Ind., has appointed *Harvey M. Olmstead* as its representative with an office at 1708 Sixteenth St., Denver, Colo.

## If it deserves a rating—it deserves

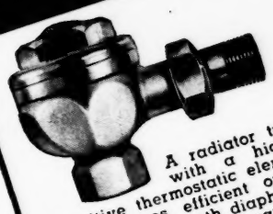
# MARSH

THE valves and traps shown here illustrate the excellence of design and construction found throughout the broad Marsh line. Some of them offer features never before obtainable — features that are as sound as they are new. All of them offer the characteristic Marsh dependability that heating men have relied upon since 1865.

Marsh Heating Specialties are available for all essential needs. In your locality there are plenty of jobs that deserve them.

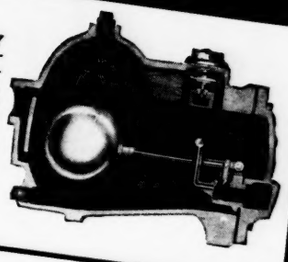
JAS. P. MARSH CORP., 2089 Southport Avenue, Chicago, Illinois

**AIRLINER**—the aristocrat of air and vacuum valves. Revolutionary features are the separate float chamber and ingenious baffle plate which eliminate spitting or spurting under every possible condition — something that has never before been fully accomplished.

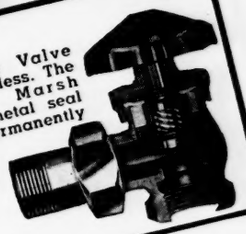


A radiator trap with a highly sensitive thermostatic element that assures efficient operation. Made in both diaphragm and bellows type—all patterns.

The Marsh No. 14 Heavy Duty Float and Thermostatic Trap for draining coils, headers, etc. The Marsh trap line includes a complete line of float and thermostatic traps as well as inverted bucket traps and other types.



A packless Valve that IS packless. The exclusive Marsh metal-to-metal seal makes it permanently leak proof. All patterns and designs.





# AIR CONDITIONING NOZZLES

Nozzles of unique Yarway Involute Design.

No internal parts or vanes to clog or erode.

Insure trouble-free air washing service.

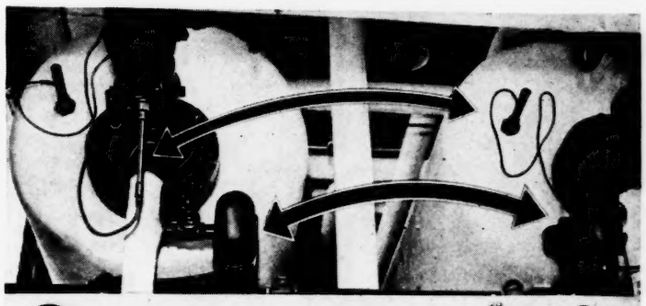
Sizes and types for all requirements.

Many large users—installations total more than 5 million gallons per minute in water cooling and air conditioning service. Write for Bulletin N-615.

YARNALL-WARING COMPANY
104 MERMAID AVENUE
PHILADELPHIA

YARWAY



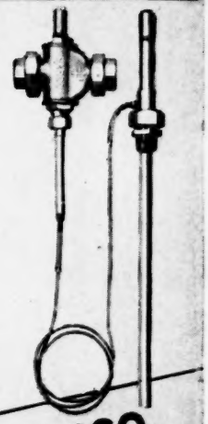


# Save WATER . . .
## SAVE HEAT . . . SAVE TIME

Yes—many times Sarco Control on water heaters saves all three. Water too hot or too cold is often wasted in the plant, and the b.t.u.'s you paid for go down the drain with it.

In process work, incorrect temperatures can produce slow-ups, rejects or even shut-downs.

You can connect up a Sarco Temperature Regulator in a day, save its cost in a few weeks—benfit by it for years. Catalog No. 52.



SARCO TEMPERATURE CONTROLS

115

SARCO SAVES STEAM

SARCO COMPANY, INC.
475 Fifth Avenue, New York, N. Y.
SARCO CANADA LTD. TORONTO, ONT.

New York Central System

One of the two Empire State Express Super-streamliners conceded to be the world's finest day trains, costing almost $2,500,000.00 to build. Equipment of the luxurious cars includes summer and winter air conditioning with capacity for complete change of air in each car in four to six minutes. The filters are AIR-MAZE.

New York Central System

• Celebrating its golden anniversary, the famous Empire State Express has replaced its previous equipment with two new super-streamlined trains. Built of stainless steel by the Edward G. Budd Manufacturing Co., Philadelphia, these new trains are equipped with every modern device for the protection and comfort of the passengers, including winter and summer air conditioning.

For the highly important function of cleaning and purifying the air in these luxurious streamlined cars, AIR-MAZE Permanent Air Filters were selected. This choice was based on the demonstrated high efficiency of AIR-MAZE as well as on the ease with which AIR-MAZE filters are restored to their original high peak performance.

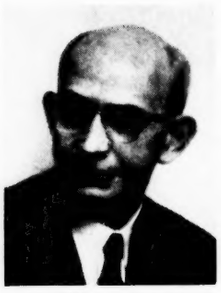
Car maintenance shops along the route are provided with duplicate spare sets of AIR-MAZE filter panels so that while one set is in operation, another is being cleaned and prepared for further service. Thus, these twin super-streamliners are always assured top notch filter performance with minimum effort and loss of time.

This outstanding recognition of AIR-MAZE advantages is further evidence of the complete adaptability of these permanent air filters to every air conditioning requirement.

*May we help you on your air filter problem?*

**AIR-MAZE CORPORATION**
5230 Harvard Avenue Cleveland, Ohio

AIR-MAZE
DEPENDABLE AIR FILTERS FOR EVERY APPLICATION

*Elmer J. Weis*

*Pacific Pump Works* announces that *Elmer J. Weis,* former aircraft parts manager, has been elevated to the vice-presidency of the company. Mr. Weis will retain an active interest in the company's engineering developments, in addition to handling his new responsibilities. He has been with Pacific Pump since its organization in 1923.

*General Controls Co.,* Glendale, Calif., has acquired the Cunningham Controls Company of Burbank, Calif. For several years, Cunningham Controls Company has engaged in the manufacture of temperature controls for installation on transport planes, specializing in airplane cabin heating controls. *L. L. Cunningham,* president, joins the General Controls organization in an engineering capacity and will concentrate on temperature control engineering and design.

*Airtemp Division, Chrysler Corp.,* Dayton, Ohio, has named *Dewey H. Dolison* as district manager for the Chicago territory, and *William Kearney* to a similar position in the Dallas territory, according to announcement by Paul B. Zimmerman, vice-president and general sales manager. Mr. Dolison began his career in the refrigeration industry as a draftsman and engineer for the Zanesville Engineering & Refrigeration Co. Later he joined the General Refrigeration Co. as manager of the Cleveland branch. He was one of the organizers of Temprite Products Co. of Detroit, and during recent years worked with General Electric on refrigeration, heating and air conditioning. Mr. Kearney started his business career as a building and maintenance engineer for an Akron rubber company. Since that time, he has been associated with the H. G. Bogart Co., Toledo, and with the General Electric Supply Co. in Dallas. During recent years, he has been sales representative for Universal Cooler Corporation.

*Dewey H. Dolison*

*William Kearney*

*Penn Electric Switch Co.,* Goshen, Ind., has appointed *Howard C. Shilling* manager of its Moline, Ill., branch office to replace *J. G. Moravec,* who has been called to active service. Until his appointment, Mr. Shilling has represented Penn in the Chicago territory. Mr. Moravec has been manager of the Moline branch since 1937, and is now on a leave of absence.

*Frick Company,* Waynesboro, Pa., announces that *D. Norris Benedict* has been appointed president, succeeding the late Ezra Frick. Mr. Benedict, who is also general manager, thereby becomes the sixth president of this organization. He has been associated with the firm since 1902, and is president of the Knickerbocker Stamping Co., a subsidiary at Parkersburg, W. Va., and a director of the Landis Machine Co., Waynesboro, Pa.

*E. H. Blywise,* president of The Grabler Mfg. Co., announces the appointment of *R. H. Sonneborn,* formerly with Republic Steel Corporation, as general sales manager, effective February 1.

*Johns-Manville,* 22 East 40th St., New York, N. Y., announces that *Dr. C. F. Rassweiler,* who joined the company last June as director of research, has been appointed a vice-president of the corporation. In his new office, Dr. Rassweiler will continue in charge of the company's research and development activities which are not largely devoted to converting the full production capacity of J-M to war uses. Johns-Manville's research laboratories are located in Manville, N. J., and are managed by *E. R. Williams,* who will continue in that capacity.

*Combustion Engineering Company, Inc.,* New York, has appointed *Albert R. Mumford* to its Research Department of that company, under the direction of *Henry Kreisinger.* A graduate of MIT, Mr. Mumford's background in fuels, combustion and steam generation covers four years as assistant fuels engineer of the Bureau of Mines, over fifteen years as research and design engineer with the New York Steam Corporation and from October, 1938, to February, 1942, as assistant director of research of the Consolidated Edison Company of New York. He has long been active in committee work of engineering societies and is the author of numerous technical papers.

*Crocker-Wheeler Electric Mfg. Co.,* New York, has appointed *Donald T. McDonald* as manager of sales promotion and publicity, a newly created department. Before joining the Crocker-Wheeler organization in 1941, Mr. McDonald was with Westinghouse.

*Manning, Maxwell & Moore, Inc.,* Bridgeport, Conn., has engaged *James H. Withers* as representative working out of the Los Angeles office. Mr. Withers' sales efforts will be directed to the distribution of Ashcroft gauges, Hancock valves, Consolidated safety valves and American industrial instruments.

## NEW TRADE LITERATURE

**Copies of catalogs and bulletins reviewed in this section are generally available without charge, unless otherwise mentioned. Address request direct to the manufacturer on your business letterhead.**

*War Work.* "How Small Industries Can Go After War Work" is the title of an illustrated booklet to show small companies how to go after contracts or subcontracts through the Contract Distribution Branch, Production Division, War Production Board, Washington, D. C., or through its regional offices in many cities in each state. Booklet contains information on how industry can secure loans for equipment to make war armament, how small companies can form pools to obtain contracts, and other helpful data. List of regional offices and addresses, the names of officers and telephone numbers are included. COPPER & BRASS RESEARCH ASSOCIATION, 420 LEXINGTON AVE., NEW YORK.

*Shut-Off Valves.* Standard size four-page folder devoted to the company's automatic gas shut-off valves important in the prevention of gas fires caused by air raid or sabotage. SECURITY VALVE CORPORATION, 548 SOUTH SPRING ST., LOS ANGELES, CAL.

*Boilers.* A catalog devoted to the company's standard covers for ball and roller bearings of flat, medium and deep types in two types of fastening flanges, lug and round. The bulletin is standard size, 4 pages, explains low unit cost in small or large quantities and the saving of costly machine set-ups. R-S PRODUCTS CORPORATION, WAYNE JUNCTION, PHILADELPHIA, PA.


Young

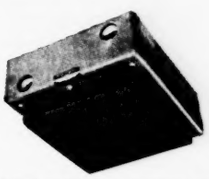
HEATING UNITS CAN TAKE IT!

On the U. S. S. North Carolina (above) and many other warships, specially-built YOUNG heating units are "taking" all the violent stresses and strains of a battleship in action. In wartime, the importance of quality and dependability in a heating unit is doubled and trebled. That's why more and more YOUNG heating units are being put to work for Uncle Sam . . . in battleships, and in factories, arsenals, military cantonments and government buildings all over the country.

YOUNG unit heaters are made in many types and sizes with capacities ranging from 19,000 to 800,000 b.t.u. per hour. They save time and labor in installation and upkeep . . . give maximum heat output with minimum fuel consumption. Patented features of construction assure long, trouble-free operation. Ask the YOUNG representative in your city for engineering data, or write the—

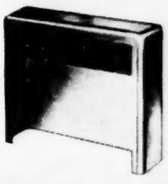
YOUNG RADIATOR COMPANY

Dept. 102-C RACINE, WIS.



YOUNG *VERTIFLOW* UNIT HEATER

YOUNG TYPE "SH" UNIT HEATER



YOUNG "STREAMAIRE" CONVECTOR

YOUNG TYPE "FH" UNIT HEATER

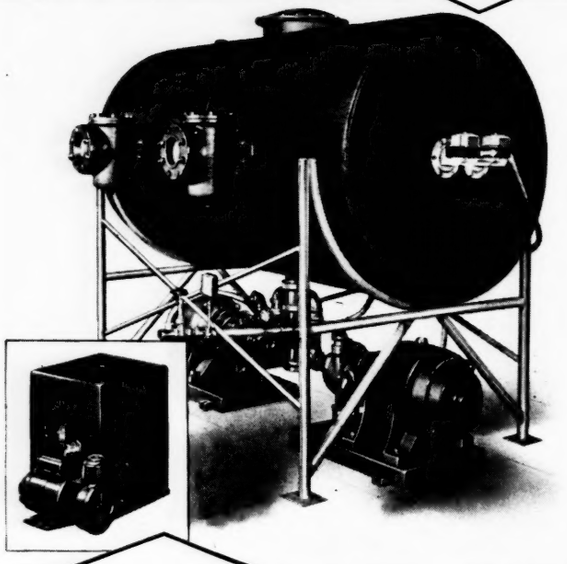
Young

HEATING, COOLING AND AIR CONDITIONING UNITS

# STERLING

*The Most* COMPLETE CONDENSATION PUMP LINE *on the* MARKET !

**65,000**
Sq. Ft. E.D.R.
Cap. 97½ G.P.M.
at 150 lbs.
660 Gallon.
48"x84" Receiver.



**5,000**
Sq. Ft. E.D.R.
Cap. 7.5 G.P.M.
at 20 lbs.
18 Gal. Receiver.

**134 TYPES *and* SIZES *to* FIT ALL YOUR NEEDS**

Between the "Biggest" and "Smallest" Pumps shown above is a great line of STERLING CONDENSATION PUMPS that offers a specific unit for almost any kind of installation. More than 134 types and sizes in a wide range of capacities from 1,000 to 150,000 sq. ft. of radiation, at pressures up to 150 lbs.

Small, compact, space-saver units for the average installation are equipped with fractional horsepower motors and rust-resistant, cast-iron receivers in new modern design. In addition, units are available with welded steel receivers where this construction is recommended—especially in higher pressures and capacities.

**Standardize on STERLING . . . The modern Quality line of Condensation Pumps that serves all your needs.**

*Write for Catalog No. 340-D*

★ ★ ★ STERLING ★ ★ ★

heating specialties

**STERLING, Inc.**

**3732-B N. Holton St., MILWAUKEE, WIS.**


*Welding.* A 55-page book clarifying proper welding process for a particular metal under various circumstances. The book, clearly written and conveniently grouped, is entitled Welding Procedures. This book gives the reader the full benefit of the manufacturer's long experience in oxyacetylene and electric arc welding and brazing. In addition to recommending process, the book recommends the best filler metals to be used for each process, and describes specialized welding techniques not commonly known. In an appendix, data are given for the calculation of electrode and gas welding rod consumption for different types of welds; also comparative welding record sheets for tabulating data that will determine the best welding method for a particular job. Metals are grouped alphabetically under such headings as Aluminum, Die Cast Metals, Malleable Iron, Steel, Wrought Iron, and so on. The book will awaken welders to the fact that where a choice exists between two or more processes the operator is prone to use the process in which he is most adept, without stopping to consider the ultimate cost. By use of the cost data sheets in the book and by gaining a keener appreciation of the fields for which gas or arc welding are particularly fitted, the operator will be able to produce better welds at less cost. AIR REDUCTION, 60 E. 42ND ST., NEW YORK, N. Y.

*Selector Charts.* A selector chart for sizing the right flexible shaft coupling and giving the type of duty, size of bore, exact dimension of coupling, rpm, kind of load cushions and price. Available with the company's complete L-F catalog. LOVEJOY FLEXIBLE COUPLING CO., 5001 WEST LAKE ST., CHICAGO, ILL.

*Gauges.* A 64-page catalog, entitled Ashcroft Gauge Book, listing all new gauges, streamlined gauge cases, gauges for special services and a complete list of Duragauges. MANNING, MAXWELL & MOORE, INC., BRIDGEPORT, CONN.

*Butterfly Valves.* Illustrated catalog 10-B, 16 pages, standard size, features standard and special butterfly valves for control and tight shut-off of air, gas, steam, liquids and semi-solids under high and sub-zero temperatures and varying pressures from 2 to 300 lb. Contains performance characteristics under all conditions of service, manual and automatic control, specifications, flow charts and a discussion and illustration of the use of bronze, steel, meehanite, molybdenum and other metals for special conditions including solenoid emergency service. Interesting explanations of wedge-tight shut-off by accurate machining and the angle of closing of the butterfly vane against the body of the valve are included. R-S PRODUCTS CORP., 4530 GERMANTOWN AVE., PHILADELPHIA, PA.

*Insulation.* The 1942 edition of the J.-M. Industrial Products Catalog, Form GI-6A, 52 pages. Included are recommendations on the use of the company's insulations and refractories for various types of service; descriptive and application information on roofings and siding, transite walls and industrial curtain walls; as well as details on transite asbestos-cement pipe, friction materials, electrical materials, packings and other products. JOHNS-MANVILLE, 22 EAST 40TH ST., NEW YORK, N. Y.

*Traps.* A standard size loose-leaf-punched eight-page bulletin No. 450 covering the company's float-thermostatic steam traps, compressed air traps and liquid level controls. Includes description, photographs, dimensional drawings, list prices and application sketches. SARCO COMPANY, INC., 475 FIFTH AVE., NEW YORK.

*Expansion Joints.* A 14-page illustrated Bulletin 35-15B on the Adsco piston-ring type, model A expansion joint. Includes details of construction, dimensions, and specifications on this joint which is made in sizes from 2 to 20 in. for all pressures up to 400 lb. AMERICAN DISTRICT STEAM CO., NORTH TONAWANDA, N. Y.

*Water Systems.* A standard size, 24-page highly illustrated booklet on selecting, installing and operating home water systems and intended for fully educating home owners on the subject of automatic water systems. Company asserts that this booklet should save its readers money and disappointments by guiding them away from costly mistakes; that it includes unbiased help in choosing the right kind of system, and that it presents valuable suggestions on installing and operating the selected system. FAIRBANKS, MORSE & CO., 600 S. MICHIGAN AVE., CHICAGO, ILL.

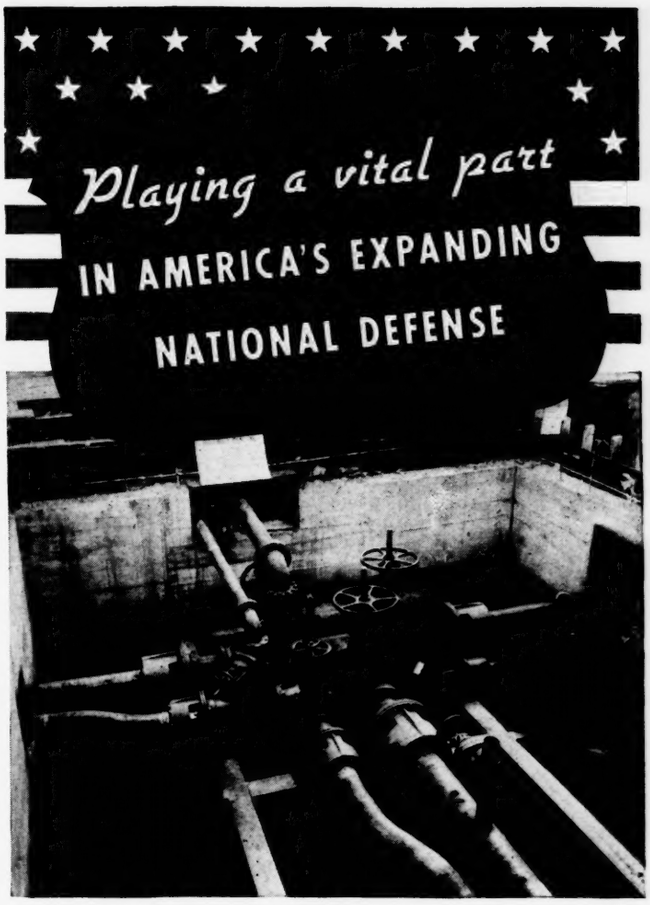
*Filters.* A 3⅜ x 6¼ in. eight-page folder entitled How to Save Heating Dollars and directing attention of the consumer to the advantages of Air-Maze permanent, washable air filter panels for residential air conditioning. AIR-MAZE CORPORATION, 5200 HARVARD AVE., CLEVELAND, OHIO.

*Underground Steam Lines.* Bulletin No. 420A giving technical data and engineering information covering the design and construction of the company's unit systems for underground steam piping. Intended as a reference manual for those concerned with the layout and purchase of underground and overhead steam mains. Scope of bulletin includes general requirements for average needs on underground heating or power piping systems, with typical layouts, sketches, diagrams, and plot plans of actual installations. It has many charts, tables, and details on piping methods, sizes, combinations, capacities, and also details of various fittings used in such systems. THE RIC-WIL COMPANY, CLEVELAND, OHIO.

*Instruments.* A standard size four-page folder List CEC, describing the company's industrial models of analyzers, indicators and recorders for laboratory and industrial applications. CAMBRIDGE INSTRUMENT COMPANY, INC., 3732 GRAND CENTRAL TERMINAL, NEW YORK

*Fireplaces.* A standard size elaborate publication of 64 pages entitled "Book of Successful Fireplaces—How to Build Them," ninth edition, profusely illustrated and giving information on factors in fireplace planning, construction details of a successful fireplace, fireplace history, fireplace difficulties, fireplace equipment and a catalog of the company's line of fireplaces. Price, 25 cents, postpaid. In Canada, 35 cents. THE DONLEY BROTHERS CO., 13900 MILES AVE., CLEVELAND, OHIO.

*Welding.* Cost of arc welding electrodes can be estimated rapidly for welding any type of joint on any thickness with either bare or coated electrodes by the use of the Electrode Consumption Calculator, a standard size, 8-page booklet. This booklet tells how many pounds of electrodes are required per linear foot of weld. Calculator includes consumption figures for both bare and shielded arc electrodes on all metal thicknesses commonly employed in making fillet welds, square groove butt joints, V and U groove butt joints, bevel grooves and J grooves. Amount of steel deposited per linear foot of weld is also shown. As a further aid on other joints not shown, the basic formulas used in these calculations are included. AIR REDUCTION, 60 EAST 42ND STREET, NEW YORK, N. Y.


ADSCO
EXPANSION JOINTS

**Over 60 years ago, ADSCO originated the idea of District Heating and built the first expansion joint.**

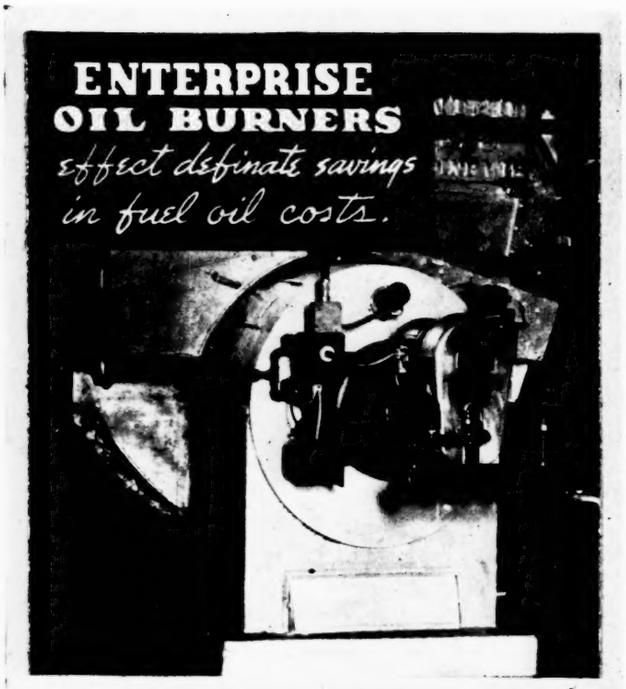
**Naturally with that period of accumulated experience behind us, ADSCO is rightfully looked upon as the ranking authority throughout the land on expansion joints.**

**Logically, today ADSCO units are approved and used by the United States Army and Navy and by national defense industries from coast to coast.**

**If your requirements include expansion joints, you'll find the breadth of our experience and our line of invaluable aid to you.**

**Write for Catalog No. 35HV**

AMERICAN DISTRICT STEAM COMPANY NORTH TONAWANDA, N. Y.
Making "UP-TO-DATE" Steam Line Equipment for over 60 years




ENTERPRISE
ENGINE AND FOUNDRY CO.
18TH & FLORIDA STS. SAN FRANCISCO, CALIF.
DISTRIBUTORS IN PRINCIPAL CITIES


*Insulation.* A 16-page illustrated booklet entitled Fabricated Insulation covering Reyn-O-Cell. Made of cotton fibres and processed to be flameproof and fire-resistant, Reyn-O-Cell insulation is being used extensively in defense housing projects. Booklet describes the new insulation in detail and the various forms in which Reyn-O-Cell is available. REYNOLDS METALS CO., INC., RICHMOND, VA.

*Speed-Changers.* Standard size 20-page bulletin B6013A, devoted to and including diagrams, operating data and selection tables on the company's Vari-Pitch speed changer. ALLIS-CHALMERS MFG. CO., MILWAUKEE, WIS.

*Controls.* A Controls for Industry folder, F-1695, containing data sheets on the following: motor-operated valves—for steam, air, oil, gas, water and other fluids; control motors—for use as damper operators and power units; thermostats—for room, duct and immersion application; and program controllers—for sequence operations. BARBER-COLMAN COMPANY, ROCKFORD, ILL.

## COMING EVENTS

**APRIL 9-10.** Midwest Power Conference, sponsored by the Illinois Institute of Technology, with the cooperation of nine mid-west universities and seven mid-western engineering organizations. Headquarters, Palmer House, Chicago, Ill. Further information available from C. A. Nash, Conference Secretary, Illinois Institute of Technology, 3300 Federal St., Chicago.

**MAY 24-29.** 53rd annual meeting of the Heating, Piping and Air Conditioning Contractors National Association, Hotel Schroeder, Milwaukee, Wis.

**JUNE 10-12.** 33rd annual meeting of the National District Heating Association, Dayton, Ohio. Further information from John F. Collins, Jr., secretary, NDHA, 827 N. Euclid Ave., Pittsburgh, Pa.

**WEEK of JUNE 14.** Semi-annual meeting, American Society of Heating and Ventilating Engineers, Hotel St. Paul, St. Paul, Minn.

## H&V'S PHOTOS

**FRONT COVER**—Charles Phelps Cushing, New York, N. Y.

**PAGE 29**—Thomas Studio, Salem, Mass.

**PAGE 47**—Acme Newspictures, Inc., New York, N. Y.

**PAGE 51**—(Top and Upper Center) Press Association, Inc., New York, N. Y.

**PAGE 52**—(Left) Wide World Photos, New York, N. Y. (Right) General Motors Corp., Detroit, Mich.


SC Kathabar
CONTROLLED ATMOSPHERES
GIVE YOU Measured HUMIDITY
FOR PROCESSING OR COMFORT

● More and more Kathabar Systems are selected for "difficult" industrial processing jobs and *chill, shock* and *clamminess-free* comfort applications. Why? Because today's needs are for more, better and faster production. You can maintain your volume, organization and profits by specifying and installing Kathabar in '42.

If you want to know how—'phone, write or wire for a Kathabar representative.

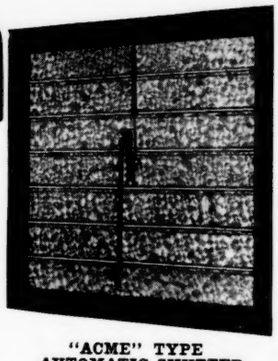
SURFACE COMBUSTION
TOLEDO, OHIO

Elgo Ventilating Specialties

A Quicker-Acting Automatic Shutter

A shutter with a patented spring mechanism that makes it unusually sensitive to air currents. Its louvers open easier and wider, snapping tight shut when the air current stops. Adaptable to a wide range of uses, because its tension can be adjusted for different air velocities.

*Write for circular and prices!*



"ACME" TYPE AUTOMATIC SHUTTER
Rear View (Closed)

Free CATALOG

ELGO SHUTTER & MANUFACTURING CO.
6968 W. Jefferson Detroit, Mich.

# A WAR MESSAGE
## *to*
# ALL EMPLOYERS

## ★ From the United States Treasury Department ★

WINNING THIS WAR is going to take the mightiest effort America has ever made—in men, in materials, and in money! Every dollar, every dime that is not urgently needed for the civilian necessities of food, clothing, and shelter, must, if we are to secure final Victory, be put into the war effort.

An important part of the billions required to produce the planes, tanks, ships, and guns our Army and Navy need must come from the sale of Defense Bonds. Only by regular, week by week, pay-day by pay-day investment of the American people can this be done.

This is the American way to win. This is the way to preserve our democratic way of life.

Facing these facts, your Government needs, urgently, your cooperation with your employees in *immediately* enrolling them in a

### PAY-ROLL SAVINGS PLAN

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The Pay-Roll Savings Plan has the approval of the American Federation of Labor, the Congress for Industrial Organization, and the Railroad Brotherhoods. It is now in effect in several thousand companies varying in number of employees from 3 to over 10,000.

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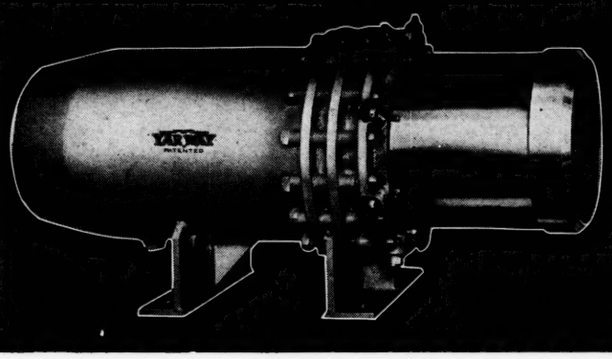

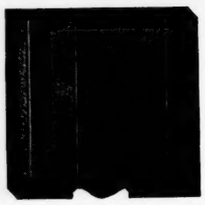

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